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# A
# DICTIONARY
# OF
# PRACTICAL SURGERY.

T. DAVISON, Lombard-street,
Whitefriars, London.

A

# DICTIONARY

OF

# PRACTICAL SURGERY:

COMPREHENDING

ALL THE MOST INTERESTING IMPROVEMENTS

UP TO

THE PRESENT PERIOD:

ALSO

AN ACCOUNT OF THE INSTRUMENTS, REMEDIES, AND APPLICATIONS EMPLOYED IN SURGERY;

*THE ETYMOLOGY AND SIGNIFICATION OF THE PRINCIPAL TERMS;*

A COPIOUS BIBLIOTHECA CHIRURGICA;

AND

A VARIETY OF ORIGINAL FACTS AND OBSERVATIONS.

Willm Pritchard

THE THIRD EDITION,
REVISED, CORRECTED, AND ENLARGED.

BY SAMUEL COOPER,

ONE OF THE SURGEONS TO HIS MAJESTY'S FORCES; MEMBER OF THE ROYAL COLLEGE OF SURGEONS; OF THE MEDICAL AND CHIRURGICAL SOCIETY OF LONDON; AND OF THE MEDICAL SOCIETY OF MARSEILLES.

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1818.

# PREFACE

## TO THE

## THIRD EDITION.

My return to private practice gives me an opportunity of republishing this dictionary, with all such alterations as have been suggested by further observation, more mature reflection, and the several considerable advances, which have been made in the science of surgery, during the last four years. In going through this long and arduous task, my best endeavours have been exerted to render the work more deserving of the unbounded favour, which the profession has conferred upon it. So numerous are the difficulties of the undertaking, however, that I should despair of giving satisfaction, were there not some encouragement in knowing, that it is the judgment of the candid critic alone which is of any value, and that as his superior knowledge makes him conscious of all these difficulties, I shall be more likely to experience indulgence from him, than from a reader whose acquirements are only superficial. I do not, however, publish the book, as an unexceptionable and perfectly satisfactory history of the whole of surgery; a thing, which has never yet been accomplished; but, as a work, which, I trust, may usefully shew itself amongst other general treatises on the subject, and vie with them in the extent and accuracy of the practical information which it communicates.

In the present edition, it will be found, that all the most interesting modern improvements, are blended with the solid and durable labours of the ancients. At the same time, it has been my endeavour to avoid every unjust partiality to what is either very old, or entirely new and recent. It has indeed been a principle with me, that no opinion, nor practice, in surgery, ought to command veneration, merely because it may happen to have antiquity, or novelty, for its recommendation. Our ancestors have left us many good inventions, which will be valued as long as surgery shall be practised; but, they have also bequeathed to us numerous other things, which, at the present day, ought only to be mentioned for the purpose of being condemned. The moderns themselves have likewise only partly succeeded in their praiseworthy attempts to extend the boundaries of surgical science, and if we give them the glory of having introduced several substantial and brilliant improvements, their pride ought still to be moderated by the reflection, that some of their latest innovations* are sadly destitute of real practical merit, and already sinking into insignificance.

This book, imperfect as it is, has been a work of inconceivable labour, and employed a large portion of my leisure hours, during the last ten years. It has not been accomplished without extensive professional reading, and many desirable opportunities of comparing the information, which is obtained from books, with the more faithful kind of knowledge, which is communicated by experience. Vain, however, would have been my utmost efforts to produce the present account of so difficult and unbounded a subject as surgery, had it not been for some peculiar advantages, which materially facilitated my laborious researches. An apprenticeship at St. Bartholomew's Hospital has undoubtedly been one of my most valuable means of acquiring information. Here surgical diseases were long open to my observation, in all their different forms and varieties; and here I first derived from the instructions of an Abernethy the leading principles of surgery, and an early and a lasting love of my profession. For the long space of fifteen years, I have frequently visited the most interesting cases in the same munificent establishment, and witnessed the performance of numberless operations. Several other years, spent in the service of the army, have afforded me opportunities of practising many of the capital operations myself, as well as of paying attention to army diseases in general, and to gun-shot wounds in particular,—those instructive cases, in which all the elementary, and some of the most complicated parts of surgery, are best exemplified. During the whole of my professional life, I have had constant intercourse and communication with several of the most zealous and best informed surgeons in the metropolis, by which means, I have always been likely to hear of every new fact, or proposal, which materially concerned any branch of surgery. In particular, I am indebted to my distinguished friend Mr. Lawrence, for many useful suggestions, as well as for his goodness in pointing out some valuable works to me, which I should not otherwise have known of. Lastly; my sources of information have been vastly increased by a sufficient acquaintance with German, French, and Italian, to avail myself of an infinite number of inestimable treatises on different parts of surgery, published in those languages. I repeat, that, without the union of all these advantages, it would have been utterly impossible for me to have collected the mass of instruction, contained in this comprehensive publication.

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* *Exempli gratiâ*, the method of treating erysipelas by several deep incisions; cancer by pressure, &c.

Throughout the book, the rule of citing respectable authorities, in confirmation of any particular fact, or observation, is rigorously followed, as being not only highly instructive to the reader, but, frequently, a matter of justice to the writers, who are quoted.

Another thing, which renders the work much more useful, is the plan of concluding every subject of importance with references to authors, from whose writings the most accurate information upon it may be obtained. Thus, after I have endeavoured to give the reader as full an account of a subject, as my limits will allow, or my own knowledge enable me, I do not immediately leave him; but, before my departure, take care to put into his hands the keys to additional sources of instruction. These references, which taken collectively, form a kind of bibliotheca chirurgica, brought up to the present period, constitute one of the most valuable objects of this dictionary. Indeed, I may say, that they offer an advantage, which belongs exclusively to the publication, since the thing has been altogether neglected in every other general treatise on surgery in our language. In this third edition, the works, specified at the conclusion of the articles, are nearly doubled, and the utmost care has been taken to omit none which particularly deserved selection.

With respect to other improvements, which have now been made in the publication, they are very numerous. All the new proposals, which are of a truly interesting description, are inserted and commented upon; and former errors and mistakes have been carefully rectified. In fact, every article has been very attentively revised, and many have been essentially altered, amended, and enlarged; as, for instance, *Amputation; Aneurism; Fracture; Gun-shot Wounds; Hemeralopia; Inflammation; Joints, Diseases of; Lithotomy; Mortification; Suppuration; Testicle, Diseases of; Tetanus; Venereal Disease; Wounds; &c.* Several other articles are either new, or entirely re-written, as *Hospital Gangrene; Inosculation; Ligature; Necrosis; Splints; Surgery; Varicose Veins; Urinary Calculi; &c. &c.* The article *Fracture* differs from that of the former editions, not only in containing a large quantity of additions, but also in the preference, which is now given to the adoption of the straight position of the limb in cases of broken thighs; a subject, which has long been contested, and is even now unsettled. The article, *Necrosis*, will be found to comprehend every observation of importance, published by Professor Weidmann, with whose scarce and matchless work English surgeons are very little acquainted. It merits notice, likewise, that, in this third edition, the original criticisms, facts, and remarks are much more numerous, than in either of the preceding ones. In short, the reader may have some conception of the great pains, which have been taken to improve the work, when he is informed, that, although about two hundred pages of old matter have been taken out, the contents of the present volume, exceed those of the last edition by more, than one hundred pages.

The great length of time, which a work of this kind occupies the press, and the difficulty of obtaining several books just at the moment when they were wanted, will account for the omission of a few proposals and occurrences, which ought to have been inserted. Thus, in the article *Aneurism*, some notice should have been taken of Professor Assalini's Compressor, which is a new instrument, calculated, as its inventor states, to produce an obliteration of the trunks of arteries, without dividing, or injuring their coats. It is nothing more, than a small pair of silver forceps, the blades of which are broad and flattened at their extremities, between which the artery is compressed. A spring, composed of a piece of elastic steel, is attached to the inside of one of the handles, and by pressing against the opposite handle, retains the flat ends of the blades in contact. This spring is intended to be very weak in its operation; but, by means of a screw, which passes through the handles, the pressure admits of being regulated and increased at the option of the surgeon.

A representation of Assalini's Compressor may be seen in his *Manuale di Chirurgia, parte Prima, p.* 113. In the same book, or, in my friend Mr. Hodgson's valuable *Treatise on the Diseases of Arteries and Veins,* which every practical surgeon ought to possess, a case may be perused, in which this instrument was successfully employed by Professor Monteggia, and withdrawn entirely, as early as sixty hours after its application. This last distinguished surgeon also used the compressor in an example, in which the femoral artery was wounded, and bled in an alarming degree. After forty hours, the pressure was lessened, and, in four hours more, as not a drop of blood issued from the vessel, and there seemed to be no good in leaving an extraneous body in the wound any longer, the instrument was taken out altogether. (See *Assalini's Manuale di Chirurgia, p.* 110.)

When Signor Assalini was in England, he acquainted Mr. Hodgson, that, in two cases of popliteal aneurism, in which he had himself employed this means of obliterating the femoral artery, the instrument was removed at the expiration of twenty-four hours; no pulsation returned in the tumours; and the patients were speedily cured.

With respect to the particular merit of this invention, it certainly possesses the recommendation of ingenuity; but, it operates much in the same manner, as several other mechanical contrivances, the *serrenœud* of Desault, the *presseartère* of Deschamps, the pincers of Baron Percy, &c. If there be a real advantage in the division of the internal coats of an artery by the ligature, as the experiments of Jones seem to prove, and as many of the best surgeons in this country inculcate (See *Hemorrhage* and *Ligature*), then the compressor cannot be an eligible means of obliterating an artery. It may be said, however, that experience has proved its efficacy; but, let it be recollected, that almost every method of operating for aneurisms has sometimes answered. Further experience is requisite to determine, whether Assalini's compressor would succeed as often as, or more frequently, than, the scientific application of the right kind of ligatures (See *Ligature*) which may perhaps seem slower in their effect, only because they are not in general removed as early as Signor Assalini's instrument. At the same time, it must be acknowledged, that the latter admits of being loosened, tightened again, or taken away, according as circumstances may indicate, with the utmost convenience, and without the slightest disturbance of the artery.

Perhaps, however, experience may ultimately decide, that, in cases of aneurism, it will be best to follow the method of tying the artery with a very small silk ligature, the whole of which is immediately afterwards to be cut off with the exception of the noose and knot, and an endeavour then made to heal the wound by the first intention. On this point, however, the present state of our knowledge will only allow us to speak with diffidence. My friend Mr. Lawrence lately informed me of an example, in which a surgical acquaintance of his in the country had actually adopted the plan with perfect success; the wound having united without any suppuration.

In some parts of this Dictionary, had they not been already printed, I should have referred to the late memorable case, in which the aorta itself of the human subject was tied by Mr. Astley Cooper, in Guy's Hospital. The patient had an aneurism in the groin, extending so far within the body, that the operation of taking up the external iliac artery appeared totally impracticable. The tumour had already burst, and the patient was on the point of losing his life by hemorrhage. In this dilemma, the above distinguished surgeon, ever anxious to enlarge the limits of chirurgical knowledge, determined first to try to get at the source of the bleeding by opening the swelling, and, if nothing could be done in this manner, he resolved to make his way to the aorta, by an incision through the parietes of the abdomen, and then to apply a ligature to this trunk of trunks. Suffice it here to state, that the aorta was tied; that immediate death from hemorrhage was prevented; and, what is above all things interesting, that the circulation went on in the lower extremities. The leg, however, on the same side as the tumour, became cold; but, the opposite one retained its natural warmth. The man lived thirty-six hours after the operation. With the particulars, however, respecting the symptoms preceding his death, the exact part of the artery tied, and the appearances on dissection, I am not at present acquainted.

While I am writing this preface, I observe, that a second instance has just been published, in which the internal iliac artery has been tied. The operation was performed by Mr. Atkinson, of York, in a case of gluteal aneurism. The following are a few of the particulars, as related by this gentleman: Thomas Cost, aged 29, presented himself at the York County Hospital, April 29th, 1817. He was a tall, strong, active bargeman, not corpulent, but very muscular. He was enduring great pain from a large, renitent, pulsating tumour, situated under the glutæus of the right side; an obvious aneurism. It had existed about nine months, and was the consequence of a blow from a stone. In a consultation with Dr. Lanson and Dr. Wake, the necessity of the operation was determined upon, and it was performed on the 12th of May, without any material difficulty, or interruption, except such as was the consequence of the division of, and bleeding from, the small muscular arteries. Having got command of the internal iliac artery within the pelvis, (which, says Mr. Atkinson, required the complete length of the fingers to accomplish), it was tied. Sufficient proof of its being the identical artery was repeatedly obtained, by the pressure upon it stopping the pulsation, and causing a subsidence of the tumour. Dr. Wake, Mr. Ward, and all the pupils were quite assured of the circumstance. The artery being then tied, the pulsation of the swelling entirely ceased. Some delay in placing the ligature arose from the needle not being sufficiently pliable; but, for future operations of this kind, Mr. Atkinson very properly recommends the ligature to be put round the artery by means of an instrument, resembling a catheter, the wire of which has a little ring at its extremity, and can be pushed out some way beyond the end of the tube.

The patient went on tolerably well for some time after the operation; the pulse never exceeded 130, and after a time sunk to 85 or 90. He became exhausted, however, partly by the discharge, and partly by hemorrhage, and died on the 31st of May, about nineteen days after the operation. In the dissection, the cavity on the external part of the peritoneum in the situation of the incision, was completely filled with coagulated blood. "The ligature, on moving a part of this (blood) with a sponge, readily followed it, and, without doubt, had been disengaged for some days." The internal iliac, which appeared to have been tied, had separated about an inch and a half from the bifurcation with the external iliac. By "separated" I conclude Mr. Atkinson means that the upper part of the internal iliac was separated from the continuation of the same vessel. (See *Medical and Phys. Jour. Vol.* 38, *p.* 267, *&c.*) Although this gentleman has not given a very clear account of some part of the dissection, and he has also omitted to describe the place of his external incision, or the exact parts, which he divided in the operation, yet, I think that all the circumstances of the case taken together, leave not the smallest doubt of the internal iliac artery having been actually tied. The complete stoppage of the pulsation, as soon as the ligature was applied, and the testimony of several respectable practitioners, who were present, seem, indeed, to remove all ambiguity. The profession, I think, are much indebted to Mr. Atkinson for this important communication, which was in some measure required, in order to confirm Mr. Stevens's similar case, as, it is well known, that some distinguished anatomists and surgeons in this metropolis have expressed very strong doubts of the practicable nature of the operation.

The sheet, describing the artificial anus (See *Anus, Artificial*) had been long printed, when I heard of Professor Dupuytren's new ingenious contrivance for the cure of certain forms of this loathsome affliction. The plan is to produce a cohesion of the edges of the gut. He first excites inflammation of these edges with a pair of forceps, the blades of which can be compressed together by means of a screw; and inflammation being excited, an adhesion of the ends of the intestine, which are applied to each other, takes place, and then the partition is destroyed, so as to leave a free communication between the upper and lower cavities of the intestine. Thus a passage is formed for the feces into the lower portion of the bowels, and the fistulous opening becomes obliterated. (See *Medical Repository, Vol.* 7, *p.* 64.) In order to comprehend this account well, it should be known, that, in cases of artificial anus, there is frequently a sort of angle produced in the part of the bowel which is the seat of the disease. It is this angle, which causes an obstructing projection within the intestine, the removal of which, and the excitement of the adhesive inflammation, by the pressure of the instrument, bring about the cure.

The following works and references will perhaps be considered an useful addition to that part of the publication, which is meant to form a kind of surgical Bibliotheca. It was only very recently that I became acquainted with many of them through Professor C. J. Langenbeck's Bibliothek für die Chirurgie, a learned periodical work, published at Göttingen. Some of the others have made their appearance, since the articles, to which they relate in this dictionary, were printed; the rest were inadvertently omitted.

AMPUTATION. *C. J. M. Langenbeck, Uber die Amputation des Oberschenkels, in Bibl. für die Chir. Göttingen,* 1810.

*C. J. M. Langenbeck, Von der Amputation Zwischen den Knochen der Fusswurzel. Op. cit. Göttingen,* 1811.

*J. B. Paroisse, in Opuscules de Chirurgie; Paris,* 1806.

*Ph. Fr. Walther, in Abhandlungen aus dem Gebiete der praktischen Medizin, &c.*

*Georg. Henric. Wachter, Dissertatio Chirurgica de Articulis Extirpandis, imprimis de genu extirpato in nosocomio chirurgico academiæ Groninganæ.*

*J. Lisfranc de St. Martin, Nouvelle Méthode Opératoire pour l'Amputation partielle du Pied dans son articulation tarso-metatarsienne.*

*Normen für die Ablösung grösserer Gliedmassen nach Erfahrungsgrundsätzen entworfen, von Carl. Ferd. Graebe; Professor an der Universität. zu Berlin u. s. w. Berlin,* 1812.

*J. Cross. A Case of Amputation with Obs. on Minute Silk Ligatures, &c. in Med. Repository, Vol.* 7.

*J. Thomson, Report of Obs. made in the British Military Hospitals in Belgium, &c. with some remarks upon Amputation, Edinb.* 1816.

*A. C. Hutchison, Pract. Obs. in Surgery,* 1816.

*A. C. Hutchison, Some further Obs. on the proper Period for Amputating in Gun-shot Wounds, &c.* 1817.

*D. Quarrier, in Med. and Chir. Trans. Vol.* 8. *Lond.* 1817.

ANEURISM, AND DISEASES OF BLOOD-VESSELS. *Carolus Fredericus Hübner, Chirurgus Civicus Reipubl. Hamburg. de Aneurysmatibus; Gottingæ,* 1807.

*Manuale di Chirurgia del Cavaliere Assalini; Milano,* 1812. Some of the contents of this work have been already touched upon in the preface. The author's main object is to recommend his compressor.

*C. F. Gräfe, Angiektasie, ein Beytrag zur rationellen Cur und Erkenntniss der Gefass-ausdehnungen.* This appears to me to be a valuable work, on account of the great many facts and interesting cases, to which it refers. I can here only mention a few things, which are noticed in it. Walther found five small calculi in the veins of the bladder. Stenzel met with a fatty tumour, as large as a hen's egg, in the curvature of the aorta, and several smaller swellings of the same kind in the descending part of that vessel. The patient's symptoms had been great anxiety, difficulty of breathing, and palpitations. Baillies's case of obliteration of the vena cava, and consequent dilatation of the vena azygos, is noticed. Baader describes an aneurism of the pulmonary artery, accompanied with a dilatation of the aorta. Bleuland mentions a varix of the vena cava, which caused a difficulty of swallowing by its pressure on the œsophagus. Sandifort saw an aneurism of the coronary vessels of the heart. The author records the case of a woman, who died in Jacob's Hospital at Leipzig, of a scirrhous hardness of the brain. She had been for some time previously afflicted with amaurosis. After the fat had been separated from the eye-ball, several oblong, roundish, prominences, equal in size to a small lens, appeared though the sclerotica. They arose from the subjacent veins. When the optic nerve was cut through, the central artery was found dilated to the size of a piece of straw. Several vessels of the choroides were varicose, and the retina converted into a beautiful scarlet net-work. Malacarne saw aneurisms of the dura mater, as large as a pigeon's egg, arising from several branches of the spinous artery. Blane noticed aneurisms of both the internal carotids at the sides of the sella turcica. Varices of the pia mater and plexus choroides are also recorded. All the rest of this work merits perusal.

*P. Crampton, A new method of operating for the Cure of External Aneurism, with some Obs. and Experiments, illustrative of the different methods of procuring the obliteration of arteries.* The author does not admit the utility of dividing the inner coats of the vessels with the ligature, and adduces reasons against the practice. He prefers the temporary compression of the artery, above the seat of the aneurism, by means of a largish ligature and the presse-artère. Two cases are detailed in support of the observations. See *Med. and Chir. Trans. Vol. 7. Part. 2, Lond.* 1816; and the Art. *Hemorrhage* in this Dictionary, p. 529.

ANTRUM, DISEASES OF. *Carl. Aug. Weinhold üb. die abnormen Metamorphosen der Highmorshöhlen. Leipzig,* 1810.

*Dissertatio Med. Chir. de Sinu Maxillari, ejusdem Morbis, &c. Auctore P. V. Leinicker.*

BLADDER, DISEASES AND PUNCTURE OF. *S. T. Sömmering über die schnell und langsam tödtlichen Krankheiten der Harnblase, &c. Frankfurt,* 1809. The author is a strenuous advocate for the puncture above the pubes, in preference to that through the rectum, which he thinks right only in one case, viz. when the bladder is so contracted, that it does not rise out of the lesser cavity of the pelvis, and the fluctuation of the urine can be felt in the rectum, but not above the pubes. In this opinion, he is joined by professor Langenbeck. (*Bibliothek,* 3. *B. p.* 719.)

*B. G. Schreger in Chirurgische Versuche, &c.*

*W. Schmid über Krankheiten der Harnblase, &c. Wien,* 1806.

*Wadd's Cases of Diseased Bladder and Testicles.*

BONES, DISEASES OF. *Böttcher Krankheiten der Knochen, Knorpel, und Sehnen. Konigsberg,* 1702.

*A. Bonn, Descriptio Thesauri Ossium Morbosorum Hoviani. Amst.* 1783.

*J. Howship, Obs. on the Morbid Structure of Bones, and an Attempt at an Arrangement of their Diseases; Med. and Chir. Trans. Vol.* 8, *p.* 57, *London,* 1817.

*Clossius über die Krankheiten der Knochen, Tubingæ,* 1798. For many other works, see the end of the article *Necrosis.*

BRONCHOCELE. *A. Maas, Dissertatio sistens glandulam thyroideam tam sanam quam morbosam, &c.*

CANCER. *Dissertatio Medico-Chirurgica de Cancro Labii Inferioris, observationibus illustrata, auctore. H. Stark.* Of this essay, Professor Langenbeck speaks in high terms. Arsenic the most efficacious internal medicine. The following formula is recommended. "℞. Arsenici Albi drachm. dimid. Aq. comm. stillaticiæ unc. sex. M. Digerantur vase vitreo clauso in balneo arenæ justi caloris ope per horas sex, tum adde Sodæ Carbonicæ puræ drachm. dimid. antea solut. in aq. Cinnamom. simpl.

unc. duab. M. Digerantur denuo per aliquot horas in loco temperato. Hac solutione bis terve quotidie ad guttas 8—10—15, utimur."

*C. Lane's Case of Ill-conditioned Ulcer of the Tongue successfully treated by Arsenic. Vid. Med. and Chir. Trans. Vol.* 8, *p.* 201, *&c. Lond.* 1817.

Cataract. *Karl. Aug. Weinhold's Anleitung zur Reclination des Grauen Staars mit der Kapsel;* 1809.

*G. H. Buchorn, Diss. de Keratonyxide, Halæ.*

*C. J. M. Langenbeck, Prüfung der Keratonyxis einer Methode den grauen Staar durch die Hornhaut zu recliniren, oder zu zerstuckeln nebst erläuternden Operations geschichten. Gottingen.* 1811.

The term, *keratonyxis*, derived from *κερας*, a horn, and *νυξις*, a puncture, is employed by the Professors in Germany to denote the operation of couching performed through the cornea, or horny coat of the eye, the opaque lens being in this manner sometimes depressed, sometimes broken piecemeal, and, in other instances, merely turned, so as to place its anterior and posterior surface in the horizontal position. The latter method is what the German surgeons particularly imply by the phrase *reclination.*

I have not yet had an opportunity of looking over the two foregoing publications; but, my friend Mr. Lawrence, whose skill and knowledge in diseases of the eye are well known, informs me, that the contents of these books are very interesting. The name of Langenbeck, indeed, would have been to me a sufficient pledge of this fact, with regard to his own essay.

Dislocations. J. Miriel; Obs. on the Dislocation of the upper head of the radius backwards, in *Journal de Med. Chir. &c. par Corvisart, &c. T.* 15.

*Delpech, Précis Elémentaire des Maladies Reputées Chirurgicales, T.* 3. *Paris,* 1816.

Ear, Diseases of. *J. B. Paroisse,* in *Opuscules de Chirurgie.* Successful perforation of the tympanum.

Exophthalmia. Extraordinary case of, by Petitbeau, in *Journ. de Med. Chir. &c. par Corvisart, &c. T.* 14.

Fractures. *Marius Hagedorn, Abhandlung über den Bruch des Schenkelbeinhalses, nebst einer neuen Methode denselben leicht und sicher zu heilen;* 1812.

*Assalini's Manuale di Chirurgie; parte prima; Milano,* 1812. The author strongly disapproves of the employment of all tight bandages, and of covering the whole of a broken limb with splints. He was called to a gentleman of rank at Paris, who had broken the knee-pan transversely. He laid the limb upon a concave splint, which was adapted in shape to the under surface of a part of the leg and thigh. No bandage was used, merely two leather straps, which crossed upon the knee, and included the fractured bone. A perfect bony union was thus easily effected. Assalini afterwards extended the use of a concave splint, applied under the limb to fractures of the leg and thigh. In the first of these cases, however, only the thigh is received in the hollow splint, and from this two branches, or lateral splints, go along the leg. The apparatus has also a kind of sole for the support of the foot. As this simple contrivance is fastened with a very few straps, and no plasters, or bandages, are used, the surgeon has constantly a view of the whole front of the limb, and of the fractured part of it, which Assalini thinks a great advantage. In compound fractures, he puts no other dressings on the wound but linen compresses, which are kept continually wet with cold water.

*J. N. Sauter's Anweisung die Beinbrüche, vorzüglich die complicirten und den Schenkelbenhalsbruch zu heilen.* 1812.

*Delpech, Précis Elémentaire des Maladies Chir. T.* 1, *Paris,* 1816.

FUNGUS HÆMATODES. *Cases of Fungus Hæmatodes, with Obs. by G. Langstaff, and an appendix, containing two cases of analogous affections, by W. Lawrence, in Med. and Chir. Trans. Vol.* 8, *p.* 272, *&c.*

GUN-SHOT WOUNDS. *J. B. Paroisse in Opuscules de Chirurgie, Paris,* 1806.

*Assalini, Manuale di Chirurgia, Milano,* 1812.

*Hennen's Obs. on Military Surgery, and the Arrangement and Police of Hospitals.* N. B. in the press.

HEAD, INJURIES OF. *J. B. Paroisse in Opuscules de Chirurgie; Paris,* 1806.

HEMORRHAGE. R. Blagden, Case of Fatal Hemorrhage from the extraction of a tooth. The patient 27 years of age. He had had a tooth extracted when a boy, in consequence of which operation, the bleeding continued for twenty-one days, from the socket, before it ceased. A very slight cut on the head was also followed by an alarming bleeding, which could not be stopped by pressure, styptics, or the ligature, so that it became necessary to apply the kali purum, which succeeded. On having another carious tooth taken out, a profuse bleeding followed, which resisted the effect of styptics, caustic, and every means adopted to stop up the socket. The actual cautery was tried in vain. The dangerous condition of the patient seemed to leave no other resource, but that of tying the carotid artery, which was done by Mr. Brodie. But even this proceeding failed to suppress the hemorrhage, which proved fatal. *Vid. Medical and Chir. Trans. Vol.* 8. *p.* 224, *London,* 1817.

*John Cross, A Case of Amputation, with some Experiments and Obs. on the securing of Arteries with minute silk ligatures.* The author relates several experiments for the purpose of ascertaining the utility of tying arteries with such ligatures, and cutting the two ends off close to the knot. They were performed on the carotids of dogs and asses. The conclusions are unfavourable to the practice. After one case of amputation, where the method was tried, the stump healed slowly, and for several months small abscesses repeatedly formed. See *London Medical Repository, Vol.* 7, *p.* 353.

HERNIA. *Rudtorffer's Abhandlung über die einfachste und sicherste operations Methode eingesperrter Leisten; und Schenkelbrüche, &c.* In this work, the erroneous plan of cutting the ring inwards is inculcated, both in the external and internal inguinal rupture. The author, however, seems to have performed many operations in this manner, without any accident from hemorrhage; a piece of good fortune, which Professor Langenbeck ascribes to the circumstance of the knife having always been applied, as Rudtorffer directs, to the middle of the inner pillar of the ring, and to the cut having been very limited. Langenbeck is of opinion, that, if the knife had been applied a little lower, and the incision carried to any extent, the epigastric artery, in ordinary cases, would not have escaped injury. Many of Langenbeck's criticisms on this book are very just and judicious.

*Guincourt, in Journal de Médécine, &c. par Corvisart, T.* 16. A swelling of the testicle, attended with all the symptoms of a strangulated hernia. A case, somewhat analogous, fell under my own observation, and is recorded in the article Hernia Humoralis.

*Delpech, Précis Elémentaire des Maladies Chir. T.* 2, *Paris,* 1816.

*Langenbeckii, Commentarius de Structura Peritonæi, Testiculorum tunicis, eorumque ex abdomine in Scrotum descensu, ad illustrandam herniarum indolem; Gottingæ,* 1817.

*Cloquet, Recherches Anatomiques sur les Hernies de l'Abdomen; Paris,* 1816.

*Dr. H. Weinhold, Herniotomie und Castration mit Zurücklassung des Hodens.* See *Journ. der Practischen Heilkunde Herausgegeben von C. W. Hufeland und K. Himly.* 1812. *Zehntes Stuck, p.* 112. This was a case in which the operation for bubonocele was performed; and as the testicle was diseased, the surgeon made a complete division of the spermatic cord, tied the spermatic arteries, and then left the testicle in its natural situation. After a time, the absorbents had diminished the part to a very inconsiderable little tumour.

HERNIA CEREBRI. *E. Stanley, Cases of Hernia Cerebri with Observations, in Medical and Chirurgical Trans. Vol.* 8; *London,* 1817.

*Delpech, Précis Elém. des Maladies Chir. T.* 2, *p.* 447, *&c.*

*J. F. Wendelstedt, in Sammlung. Med. und Chir. Aufsätze; Auswüchse am Kopfe neugeborener Kinder.*

JOINTS, DISEASES OF. *J. A. Albers Abhandlung über die Coxalgia, &c. Wien,* 1807, 4to.

*J. N. Rust, Arthrokakologie, oder über die Verrenkungen durch innere Bedingung, &c. Wien,* 1817. *4to.* The greater part of this work is on the disease of the hip-joint, and the treatment with the actual cautery is particularly recommended.

*Böttcher, Krankheiten der Knochen, Knorpel, und Sehnen. Königsberg,* 1702.

*D. Dylii, de Claudicat. Dissert. Lugd. Batav.* 1798, *4to.*

*Munck von Rosensköld, Dissert. de Morb. Artic. Coxæ; Lundii.* 1799.

*Frank, Dissert. de Morbo Coxario. Marburgh,* 1804.

*Preisfrage, worin besteht eigentlich das Übel, das unter dem sogenaunten freywilligen Hinken der Kinder bekannt ist? beautwortet von D. W. A. Ficker, &c. Wien,* 1807, *4to.*

*De Haen, Ratio Medendi, &c. Vidob.* 1759. *Cap.* 4. *de Coxario morbo.*

*Van der Haar, Gen. en Heelk Mengelst. Amst.* 1797.

*C. F. Dörner, de gravioribus quibusdam cartilaginum mutationibus. Tubingæ,* 1798.

*Paletta, Adversaria Chirurg. prima. 4to.*

INTUSSUSCEPTION. *Langenbeck in Bibl. für die Chirurgie; Gottingen,* 1811. An instance, in which a prolapsus of the large intestines protruded half an ell out of the anus. The disease had lasted thirty weeks. The author made an incision into, or rather through, the protruded inverted bowel, immediately below the sphincter ani. He first divided the inner vascular coat, then the muscular, and lastly the outer, in succession, and with great care. He now discovered within the protruded inverted bowel, which he had opened, another part of the intestinal canal, which was not yet inverted. He remarked upon it the appendices epiploicæ, and the white shining peritoneal coat. This last portion would also have become inverted, had the disease continued. Professor Langenbeck next reduced the latter uninverted part, and afterwards succeeded in replacing the rest of the protrusion; which did not fall down again on the boy going to stool. No bad symptoms immediately followed; but, the lad being very weak survived only eight days. This case is instructive, as it proves that every prolapsus of the rectum is not simply a relaxation of its internal coat. The operation was also rational, and judicious.

**Keratonyxis.** A new term in surgery, derived from *κερας,* a horn, and *νυξις,* a puncture, used to express the various modes of couching through the cornea. See what has been observed on this subject in a preceding page, article *Cataract.*

**Lithotomy.** *Fr. X. Rudtorffer über die Operation des Blase nsteinsnach Pajola's Methode.* Professor Pajola, of Venice, was the pupil of Le Cat, and his method resembles that of his master. He is stated to have cut for the stone 550 patients with success; which deserves notice, because his operation has for its principles, dilatation, and no division of any part of the bladder. He makes an incision into the groove of the staff, with a lancet-pointed, double-edged knife, called an urethrotome, the blade of which has upon its centre a groove, that is continued to its very point, and serves to guide the beak of another instrument, called the cystotome, into the groove of the staff. As the professed intention of the cystotome is only to cut the prostate gland, its name is ridiculous. It consists of a handle, and very slender blade, which is not connected with the handle, but with its sheath, by means of a little joint, close to the beak of the instrument. When the cystotome is opened as far as possible, the end of the blade, furthest from the beak, is twelve lines from the sheath. In this position, it is held by a transverse piece of steel, which admits of being pushed more or less out at the option of the surgeon, and can be fixed by means of a screw. Pajola, like Scarpa, considers cutting the neck of the bladder dangerous, and he merely divides the prostate, after which he introduces a blunt gorget, and along this a species of forceps for dilating the neck of the bladder in all directions. As Langenbeck observes, great as the success of this lithotomist has been, his method of operating has little to recommend it; and every thing must be ascribed to his individual skill, and intimate knowledge of the parts. Langenbeck even prefers Le Cat's method, in which there is no need of such a multiplicity of instruments. The blunt gorget and dilator are perfectly unnecessary, as the finger would do the purpose of both.

*Dr. R. A. Langenbeck, Krankheitsgeschicte einer Steinkrankheit, &c.* In this case, a stone made its way out of the bladder by ulceration, and was discharged immediately behind the testicles. See *Bibliothek für die Chirurgie, Göttingen,* 1809.

*C. J. M. Langenbeck, Abanhdlung über eine einfache und sichere, Methode des Steinschnitts; Würzb.* 1802.

*Meyer, Geschichte eines Steinschnittes.* A case, in which the lateral operation was attempted, but, the calculus could not be extracted on account of its size. Its greatest diameter was about 3½ inches. The patient died. It appears to me, that the opening ought to have been made ample, and the stone broken; by which means, the disagreeable circumstance of removing the patient from the operating table with the stone in his bladder, might easily have been avoided. Perhaps, also, the event of the case would then have been entirely different. We learn from the author, who practises at Zurich, that, in that part of Switzerland, the stone is a very uncommon disease, and the opportunities of performing lithotomy of course very rare.

*Joh. Jacob. Hartenkeil, Dissert. de Vesic. Urinar. Calcul.*

*Delpech, Précis Elém. des Maladies Chir. T.* 2, *p.* 193, *&c. Paris,* 1816.

**Ophthalmy.** *Ph. Fr. Walther, Abhandlungen aus dem Gebiete Pratischen Medizin, besonders der Chirurgie, und Augenheilkunde.*

*Assalini, Manuale di Chirurgia; Milano,* 1812. The author satisfactorily proves, that the purulent ophthalmy, which affected the French army in

Egypt, was not caused by the sand; and he conceives, that the best way of avoiding the complaint is not to expose one's self to the damp, cold, nocturnal air. He found venesection, all emollient applications, and eye-waters hurtful. He first purged his patients, and then introduced into their eyes a few drops of a solution of lunar caustic, and acetite of lead. He speaks favourably of leeches, and sometimes he put a small blister on the temple, or behind the ears. He had no suspicion of the disease being infectious.

*C. Hohnbaum, Ueber eine besondere Form der Skrophulösen Augenentzundung, &c. in Journ. der Practischen Heilkunde Herausgegeben von C. W. Hufeland and J. C. F. Harles, Achtes Stück, p.* 88.

*Mackesy, in Edinb. Med. and Surgical Journal, Vol.* 12, *p.* 411. This gentleman, who is surgeon of the 62d regiment, applied to his own eyes, linen impregnated with matter discharged from the eyes of patients in the fully formed stage of the purulent Egyptian ophthalmy, and even allowed some of the matter to get between the eyelids; yet, the disease was not produced. This fact corroborates the opinion, that the disease is not contagious.

PENIS, DISEASES AND AMPUTATION OF. *J. H. Thaut, Diss. de Virgæ Virilis Statu sano et morb. ejusdem imprimis amputatione.*

*Wadd on Diseased Prepuce and Scrotum; London,* 1817.

*B. G. Schreger's Chir. Versuche.—Neue Methode den Penis zu Amputiren.* When the penis is amputated near the pubes, the remainder shrinks under that bone and within the integuments so far, that it is difficult to tie the arteries. In order to obviate this inconvenience, the author recommends the skin to be drawn forwards, and fixed with a band; then to make an incision only deep enough to divide the dorsal arteries, which are to be tied, before the knife is used again. The incision is then to be continued perpendicularly, till the two arteries of the corpora cavernosa are cut. These are now to be tied. Then the corpus spongiosum and its two arteries are to be cut through, which last are to be secured. Lastly, the rest of the skin of the penis is to be divided. In this way the author amputated a diseased penis, of which only a part, about an inch in length, was sound.

PROSTATE GLAND, DISEASES OF. *S. T. Sömmering über die Krankheiten der Harnblase und Harnrohre by Männern in hohen Alter; Frankf.* 1809.

*Dr. W. Schmid über die Krankheiten der Harnblase, Vorsteherdrüse, und Harnrohre, Wien,* 1806.

PUPIL, ARTIFICIAL. *De Pupillæ Artificialis Conformatione Libellus. Auctore T. G. G. Benedict. Lips.* 1810.

RECLINATION. A new term, employed abroad, to denote the operation of turning a cataract, so as to change the position of its anterior and posterior surfaces.

RECTUM, DISEASES OF. *B. G. Schregen's Chir. Versuche; Tuberculöse Excrescenzen des Afterdarms.*

VAGINA. *H. Cole, Case of Calculus in the Vagina of a Child;* See *London Med. Repository, Vol.* 7, *p.* 109. The child eight years old. Two calculi were taken out with some difficulty. One weighed two ounces and a half; the other an ounce and a half. In the centre of the smaller, a metal button was discovered; the other had no nucleus.

Urethra, Diseases of. *S. T. Sömmering, über die Schnell und langsam tödtlichen Krankheiten der Harnblase und Harnröhre, &c. Frankfurt sur Mayn*, 1809.

*Dr. W. Schmid über diejenigen Krankheiten der Harnblase, Vorsteherdrüse und Harnröhre, &c. Wien*, 1806.

*J. Abercrombie in Edinb. Med. and Surgical Journal, vol.* 12, *p.* 373. A case of calculus in the urethra, producing dysury; relieved by an enema of tobacco—After its administration, the patient soon felt a strong desire to void his urine, and "upon making the attempt, a large calculus came rolling along the urethra with complete relief of all his complaints."

*Wadd's Practical Observations on the Nature and Cure of Strictures in the Urethra*, 1811.

*J. Cross, Sketches of the Medical Schools of Paris; Lond.* 1815. This book contains an account of the way, in which the French and some of our own surgeons force their way through strictures with a conical silver catheter. The subject is noticed in this dictionary in the article *Catheter;* and it ought to have been again mentioned in the article *Urethra.*

Urinary Calculi. *A. Marcet, an Essay on the Chemical History and Medical Treatment of Calculous Disorders; London,* 1817. This work is highly deserving the attention of the profession, as containing, besides much medical and chemical information, many observations, which are purely surgical, and a valuable collection of documents, not to be found in any other publication. From the inquiries, instituted by the author, it appears, that, in this country, the average proportion of deaths from lithotomy is no less, than one in five operations; and that the proportion of calculous cases, admitted into our hospitals, is one in each three, or four hundred cases of all descriptions. A remarkable case is recorded, in which the usual symptoms of stone in the bladder were prevented by the calculus being encysted. The foreign body weighed 3083 grains. A curious case is also mentioned, in which a calculus in the urethra was mistaken for a stricture, and an attempt actually made to destroy it with caustic. However, as Dr. Marcet correctly observes, though the presence of a stone in the urethra may sometimes at first be mistaken for stricture, the true nature of the case is soon unequivocally indicated by a partial, or sometimes a total suppression of urine; by severe pain in the particular spot, in which the calculus is lodged, and by subsequent inflammation and tumefaction of the part. The presence of a stone in the kidney, the author observes, is generally accompanied with long continued pain in the situation of that organ, and purulent and bloody urine. Yet, says he, cases of this kind occur, in which these symptoms are scarcely perceptible; and in one extraordinary example under the care of this eminent physician, where nearly the whole kidney was occupied by calculi, there were no symptoms, that led to a suspicion of the disease, and the patient died of hydrothorax. This fact strikingly evinces the impropriety of ever attempting nephrotomy, except under the circumstances, which have been stated in this Dictionary. The symptoms of a stone in the prostate gland are also equivocal, resembling those of stone in the bladder; and, as Dr. Marcet remarks, although there is, in such a case, commonly some difficulty of voiding the urine, and uneasiness about the neck of the bladder, yet, sometimes, concretions exist in the prostate gland, without producing any great inconvenience, and sometimes without their existence being suspected. A particular case is recorded, in which the calculi in this gland could be felt with a catheter, and also by manual examination in the rectum. It was proposed to extract them by a small incision made through this intestine into the prostate; but, the patient would not consent. After death, many calculi were found in this part and also in the kidneys.

Dr. Marcet has taken the trouble to procure several very interesting documents, respecting the comparative frequency of urinary calculi in different countries; the average number of operations; &c.—One from the Norwich and Norfolk Infirmary particularly merits attention. In this hospital, all the calculi, which have been extracted by operation during the last 44 years, amounting to 506, have been carefully preserved, with the circumstances annexed to each case, and the events of the operations recorded. Dr. Marcet gives the results in a tabular form as follows:

Returns of the Cases of Lithotomy in the Norfolk and Norwich Hospital from 1772 to 1816.

| | Number of Operations. | | | Deaths. | | |
|---|---|---|---|---|---|---|
| | Children under 14. | Adults. | Total. | Children. | Adults. | Total. |
| Males | 227 | 251 | 478 | 12 | 56 | 68 |
| Females | 8 | 20 | 28 | 1 | 1 | 2 |
| | 235 | 271 | 506 | 13 | 57 | 70 |

From this table, says Dr. Marcet, it appears, that the mean annual number of cases of lithotomy in the Norwich hospital, during the last 44 years, has been 11½, or 23 in every two years; and that the total number of fatal cases, in the 506 operations, is 70, a proportion of deaths, corresponding to 1 in 7¼, or 4 in 29. The proportion of females, operated upon, is to that of males, as 58 to 1000, or about 1 to 17. The mortality from the operation in children is only about 1 in 18; while, in adults, it is 4 in 19, or nearly quadruple. It appears also, from the investigations of Dr. Marcet, that the proportion of 506 operations of lithotomy, in the Norwich hospital, out of 18,859 patients, which corresponds to about 1 in 38, exceeds, in an astonishing degree, that obtained from any of the other public institutions, to the records of which he has had access. In St. Thomas's hospital, the average number of operations of lithotomy, annually performed during the last ten years, has been 5½, or eleven in each two years; and the total number of patients, admitted during the same period, being 29,065, makes one case of stone in each 528 patients. When, however, Mr. Cline belonged to the hospital, the cases of lithotomy amounted annually to as many as 10.

In St. Bartholomew's hospital, the average number of operations of lithotomy, during five years, has been 11, or one case in each 340 patients. In Guy's hospital, it is calculated, that, during the last 20 or 30 years, 9 or 10 cases of lithotomy have occurred every year, or about 1 in every 300 patients. On the whole, Dr. Marcet infers, that the operation is not so frequent in London now, as it was formerly.

It appears also from the researches of the author, that, although the proportion of children afflicted is great, yet that this is only the case with respect to those of the poor classes of society; and that in children, who are well fed, the same frequency is not observed. Thus, in the Foundling, out of 1151 children admitted during the last 27 years, there have been only 3 cases of stone; and, in the Military Asylum, only one case has occurred in 6000 children, who have been admitted. The patient was a female, and the stone was discharged without operation.

At Edinburgh, in the Royal Infirmary, the average number of stone cases has not exceeded two during each of the last six years, although the annual admissions are about 2000.

In the Hôpital de la Charité, at Paris, the average number of annual cases of lithotomy is said, on the authority of M. Roux, to be from 10 to 12, and the total number of patients admitted every year, from 2500 to 2700. The proportion of deaths is as 1 in 5 or 6. In the Hôpital des Enfans Malades, out of about 3000 children annually admitted, the average number of stone cases is about 6. The average of deaths there is stated, on the authority of Dr. Biett, to be rather less than 1 in 20 operations; a proportion of failures, as Dr. Marcet remarks, still smaller than that amongst children in the Norwich Hospital.

According to the author, lithotomy is very rare in Vienna; not because the disease is unfrequent, but, in consequence of prejudices against the operation. Dr. Froriep, ex-professor of surgery at Tubingen, and physician to the late king of Wirtemburg, now on a visit to London, informs me, however, that this statement is inaccurate, and that lithotomy is a very common operation in the Austrian metropolis, where Pajola's method seems to prevail.

At Geneva, in a population of 30,000, lithotomy has been performed only 13 times; yet, at Lyons, which is not more than 80 miles distant, the disease is frequent.

In tropical climates, the formation of urinary calculi is almost unknown; and Dr. Scott, who resided so long in India, did not meet with a single instance, though some cases, which he says were imported, were not relieved by the climate. The fact of the rarity of the disease in hot climates leads Dr. Marcet to connect the circumstance with the changes in the urine, known to arise from different conditions of the surface of the body; and he thinks it worth our while to inquire, whether there may not be some essential connexion, between the state of the cutaneous functions, and the greater or less prevalence of this class of disorders. Certain it is, as the able author has remarked, that there must be some general causes of urinary calculi, independent of any of the peculiarities of food, or beverage, to which they are usually ascribed. Climate, and certain ages of life, have undoubtedly more influence, than any other circumstances, with which we are acquainted. But, it will appear from what is stated in the article *Urinary Calculus* of this Dictionary, that our knowledge of the subject is yet very unsettled, and imperfect.

The experience of Dr. Marcet coincides with the observation made by Mr. Brande (*Phil. Trans.* 1808, *p.* 238) that persons, who have voided mulberry, or oxalat of lime calculi, are much less liable to a return of the complaint, than those, who have been afflicted with lithic calculi. (*P.* 78.)

I regret, that the late appearance of Dr. Marcet's able publication prevents me from availing myself of a great deal of additional information in it; but, my chief design, in laying before the reader the foregoing observations, is to impress him with a just sense of the nature of the publication, in order that he may be induced to consult it himself.

On the subject of the mortality after the operation of lithotomy, it deserves attention, that, when I was an apprentice at St. Bartholomew's, the deaths were numerous, and with some of the operators, I should estimate them as 1 in 3 cases. A very large proportion of the patients lost were children, a circumstance, which differs from the general result of Dr. Marcet's inquiries. I think nearly half the patients, formerly operated upon in the last hospital, had peritonitis afterwards; but, at present, the deaths are so diminished, that not a single patient has died there after lithotomy for more than two years past; and peritonitis is a much less common consequence of the operation. Now, although it must be acknowledged, that lithotomy has not been done so often as usual at St. Bartholomew's during the last year, or two; yet, the fact of no patients having been lost, seems to evince some improvement in the instruments employed, or in the mode of operating. At all events, it should be known, that beaked knives have there been very commonly substituted for gorgets, which, a few years ago, were really terrific instruments, partly on account of their bad construction, and partly by reason of the mischief, which often arose from their slipping off the staff.

28, *Chancery Lane*,
*October* 18*th*, 1817.

## *ERRATA.*

P. 268, col. 1, line 19, for *hic*, read *his*.
P. 885, col. 2, line 9, for *generally*, read *frequently*.

# A
# DICTIONARY
# OF
# PRACTICAL SURGERY.

**ABAPTISTON**, or **Abaptista** (from ἀ priv. and βάπτιζω, *immergo*, to sink under). Galen, Fabricius ab Aquapendente, and especially Scultetus, in his *Armamentarium Chirurgicum*, so denominate the crown of the trepan; or, in other words, the circular saw which makes the perforation in the bone, when the instrument is used. The term came into use, in consequence of this part of the trepan having had, at its first invention, a conical form, which kept it from penetrating the cranium too rapidly, so as to plunge the teeth of the saw in the dura mater and brain.—(*Encyclopédie Méthodique; Partie Chirurgicale, art. Abaptiston.*)

Whatever supposititious advantages the ancient practitioners of surgery may have imputed to the conical shape of the crowns of their trepans, certain it is, that modern surgeons do not, in general, adopt their notions on this subject; but, almost universally, make use of a circular saw, the figure of which is simply cylindrical.

Mr. Samuel Sharp remarks, that the great labour of working so slowly and difficultly (with a conical one) is not only very inconvenient to an operator, but by no means serviceable to the operation; for, notwithstanding the saw be cylindrical, and work without any other impediment than what lies before the teeth, yet, even with this advantage, the operation goes on so gradually, that, in all the experience which Mr. Sharp has had, he never found the least danger of suddenly passing through to the brain, if care be taken not to lean too hard on the instrument when the bone is almost sawn through. With respect to the impracticableness of inclining the cylindrical saw on any particular part of the circle, when sawn unevenly, (which was formerly alleged) whoever will try the experiment, will, in a moment, discover the falseness of the assertion. The very instance stated overthrows this reasoning; for, if the circle has already been made more deeply in one part than another, it must imply, that we have leaned with more force on one part than another, and, consequently, may at pleasure do the same thing again. Mr. Sharp next takes notice of the supposed advantage, which the conical saw had in receiving and retaining the piece of bone; a circumstance, which he, very properly, calls frivolous.—(*Sharp on the Operations of Surgery.*)

**ABDOMEN.** The **Belly.** The term is said to be derived from the Latin verb *abdo*, to hide, because many of the chief viscera of the body are concealed in the cavity, which it denotes.

When a surgeon speaks of the cavity of the abdomen, he confines his meaning to the space, which is included within the bag of the peritoneum. Hence, neither the kidneys, nor the pelvic viscera, are, strictly speaking, parts of the abdomen.

Anatomists have distinguished this large cavity into different regions, and the terms, allotted to these, are so very frequent in the language of surgical books, that some account of them in this Dictionary seems indispensable.

The middle of the upper part of the abdomen, from the ensiform cartilage, as low down as a line drawn across from the greatest convexity of the cartilages of the ribs, is called the *epigastric region.*

The spaces at the sides of the epigastric region are termed, the *right* and *left hypochondria*, or *hypochondriac regions.*

The *umbilical region* extends upward to the line, forming the lower boundary of the epigastric region, and downward, to a line drawn across from one anterior superior spinous process of the ilium to the other.

All below the last line, down to the os pubis, is named the *hypogastric region.*

The abdomen is a part of the body claiming the particular attention of every practical surgeon; for, it is the frequent situation of several of the most important surgical diseases. It is also very much exposed to wounds, and various operations are often required to be done in different parts of it. One of the most common affictions, to which mankind are subject, is that in which some of the bowels are protruded, pushing out before them a portion of the peritoneum. This disease is called *hernia*, and ought to be well understood by every practitioner who, however, can never acquire the necessary knowledge, without being well acquainted with the anatomy of the abdomen. In dropsical cases, it is frequently proper to tap the abdomen, and this operation, named *paracentesis*, simple as it may seem, requires more consideration, and attention to anatomy, than surgeons often bestow on the subject. The abdomen is also exceedingly liable to be wounded. See *Hernia*, *Paracentesis*, and *Wounds*.

ABSCESS. This term signifies a tumour containing pus, or a collection of purulent matter. Authors differ about the original derivation of the word. The most common opinion is, that it comes from the Latin *abscedo, to depart*, because parts, which were before contiguous, become separated, or depart from each other.

Abscesses are divided into two principal kinds, viz. *acute* and *chronic*. For every thing, relative to the former, see *Suppuration*; and, for information, concerning the latter, refer to *Lumbar Abscess*. The *Mammary Abscess* is a distinct article. See also the articles, *Antrum*, *Anus Abscesses of*, *Bubo*, *Empyema*, *Hypopium*, *Whitlow*, *&c*.

ACETUM. *(Vinegar.)* (From *aceto*, to be acid.) Called in the last Pharmacopœia of the London College, *Acidum Aceticum*. Vinegar is an article of very considerable use in surgery. Mixed with farinaceous substances, it is frequently applied to sprained joints, and, in conjunction with alcohol and water, it makes an eligible lotion for inflammations of the surface of the body. Vinegar has acquired reputation at the Gloucester Infirmary, for quickening the exfoliation of dead bone, which effect may be owing to its property of dissolving the phosphate of lime. The excellent effects of vinegar, when immediately applied to burns and scalds, have been taken particular notice of by Mr. Cleghorn, a brewer in Edinburgh, who communicated his sentiments to Mr. Hunter. (See *Med. Facts and Observations, Vol. II.*) *See the Article, Burns.*

In chronic inflammations of the eyes and eyelids, vinegar has lately been brought into considerable repute. It is also recommended as an application, in certain instances, in which the eyes are weak and watery. It is said to be an efficacious remedy even in cases of acute ophthalmy, after topical and general bleeding. Whenever vinegar is applied to the eye, it is in a diluted state, as may be seen in another part of this work. (See *Collyrium Acidi Acetici.*)

Very strong vinegar may be obtained by freezing and separating the water, which is mixed with the acid. When thus concentrated, it is said to be an excellent styptic for stopping hemorrhage from the nose. With this view, it may be used either as an injection, or a lotion, in which lint is to be dipped, and afterwards introduced up the nostril.

ACHILLES, *Tendon of.* So called, because as fable reports, Thetis, the mother of Achilles, held him by that part, when she dipped him in the river Styx, to make him invulnerable. It signifies that great and powerful tendon, which is formed by the junction of the gastrocnemius and soleus muscles, and which extends along the posterior part of the tibia, from the calf to the heel. When this tendon is unfortunately cut, or ruptured, as it may be, in consequence of a violent exertion, or spasm of the muscles, of which it is a continuation, the use of the leg is immediately lost, and unless the part be afterwards successfully united, the patient must remain a cripple for life.

The ancient surgeons seem not to have been well acquainted with the rupture of the tendo Achillis, which they probably might mistake for a sprain, or some other complaint. In cases, in which this part had been cut, they recommended approximating the separated portions, and maintaining them in contact by means of a suture.

When the ruptured tendo Achillis, was afterwards better understood, the plan, just mentioned, was even adopted in this case, the integuments having been previously divided, for the purpose of bringing the tendon into view. But, there is no necessity for having recourse to this painful proceeding. (*Encyclopédie Méthodique, Partie Chirurgicale, Tom. 1, p. 55.*)

The superficial situation of the tendo Achillis, always renders the diagnosis of its rupture exceedingly obvious, and the accident can only become at all difficult to detect, when there is a considerable degree of swelling, which is very rare. When the tendon has been cut, the division of the skin even allows the accident to be seen. When the tendon has been ruptured, the patient hears a sound, like that of the smack of a whip, at the moment of the occurrence. In whatever way the tendon has been divided, there is a sudden incapacity, or, at least, an extreme difficulty, either of standing or walking. Hence, the patient falls down, and cannot get up again. Besides these symptoms there is a very palpable depression, between the ends of the tendon, which depression is increased when the foot is bent, and diminished, or even quite removed, when the foot is extended.

The patient can spontaneously bend his foot, none of the flexor muscles, being interested. The power of extending the foot is still possible, as the peronei muscles, the tibialis posticus, and long flexors, remain perfect, and may perform this motion. (*Œuvres Chirurgicales de Desault par Bichat, Tom.* 1.)

The indications are to bring the ends of the divided part together, and to keep them so, until they have become firmly united. The first object is easily fulfilled by putting the foot in a state of complete extension; the second, namely, that of keeping the ends of the tendon in contact, is more difficult.

In order to have a right comprehension of the indications, we should consider what keeps the ends of the tendon from being in contact. The flexion of the foot has this effect on the lower portion; the contraction of the gastrocnemius, and soleus on the upper one. The indications then are to put the foot in an unalterable state of extension, and to counteract the action of the above muscles.

The action of the muscles may be opposed: 1. By keeping these powers in a continual state of relaxation. For this purpose, the leg must be kept half bent upon the thigh. 2. By applying methodical pressure to the muscles; methodical, because it is to operate on the fleshy portion of the muscles, and not on the tendon, the ends of which being depressed by it, would be separated from each other, and, instead of growing together, would unite to the adjacent parts. The pressure should also operate so as to prevent the ends of the tendon from inclining either to the right or left.

This kind of pressure, which the bandage ought to make, seems to have escaped the attention of all authors. Who cannot see, however, that the action of the muscles being by this means resisted, the upper end of the tendon will not have such a tendency to be drawn upward, and separated from the lower one? (*Œuvres Chirurgicales de Desault par Bichat, Tom.* 1.)

The famous Petit seems entitled to the honour of having first devised the plan of treating the ruptured, or divided tendo Achillis, by keeping the leg and foot in a particular posture, with the aid of an apparatus. Seeing that the extension of the foot brought the ends of the tendon into contact, it occurred to him that such extension should be maintained during the whole of the treatment, in order to bring about a permanent union. This happy idea, the simplicity of which should have rendered it obvious to all practitioners, once having originated, became the common basis, on which have been founded all the numerous methods of cure, which have been since recommended. (*Desault par Bichat.*)

The celebrated Dr. Alexander Monro, professor of anatomy at Edinburgh, happened to rupture his tendo Achillis. When the accident took place, he heard a loud crack, as if he had suddenly broken a nut with his heel, and he experienced a sensation, as if the heel of his shoe had made a hole in the floor. This sensation, he says, has also been observed by others, though some have complained of a smart stroke, like what would be produced by a stone or cane. Immediately suspecting what had happened, the doctor extended his left foot, in which the occurrence had taken place, as strongly as he could with his right hand, while with the left, he pressed the muscles of the calf downward, so as to bring the ends of the broken tendon as near together as possible. In this position he sat, until two surgeons came to his assistance. They applied compresses, and a bent board to the upper part of the foot, and forepart of the leg, both which they kept, as nearly as possible, in a straight line, by a tight bandage, made with a long roller. But, as this mode of dressing soon became very uneasy, it was changed for the following one. A foot-sock, or slipper, was made of double quilted ticking, from the heel of which a belt or strap projected, of sufficient length to come up over the calf of the leg. A strong piece, of the same materials, was prepared of sufficient breadth to surround the calf, and this was fastened with lacings. On the back part of this was a buckle, through which the strap of the foot-sock was passed, so that the foot could be extended, and the calf brought down at pleasure. The leg and foot were wrapt up in soft flannel, fumigated with benzoin, and the bandage was kept on day and night, the belt being made tighter, when the doctor was about to go to sleep, and loosened when he was awake, and on his guard. For a fortnight, he did not move his foot and leg at all, but, was conveyed in a chair on castors from one part of the room to another. After this, he began to move the ankle-joint, but in such a gentle manner as not to give any pain. The degree of motion was gradually increased, as the tendon became capable of bearing it, care being taken to stop, when the motion began to create uneasiness. The affected limb was moved in this way for half an hour at a time. In a few days, the hollow, between the separated ends of the tendon, became imperceptible, though the part continued soft much longer. It became, however, gradually thicker and harder until a knot was at last formed in it, apparently of a cartilaginous nature. Though this was at first as large as a middling plum, and gradually became softer and smaller, yet it did not disappear entirely. Having occasion to go out six weeks after the accident, the doctor put on a pair of shoes, with heels two inches high, and contrived a steel machine to keep his foot in the proper position. This machine, however, he afterwards changed for another, made of the same materials as the former. It was not till five months after the accident, that he thought proper to lay aside all assistance, and to put the strength of the tendon to a trial. (See *Monro's Works, p.* 661.)

It seems unnecessary to enumerate the various plans, devised since the time of Petit. Suffice it to state, that both in a wound and rupture of the tendo Achillis, the ancient method of using a suture, for keeping the ends of the tendon in contact, is at present quite exploded, and position of the limb is the grand agent, by which the cure is now universally accomplished. The following was Desault's method, which, though it was expressly designed to fulfil all the above-mentioned indications, may not after all be a more valuable practical plan, than the one adopted by Dr. Monro. After the ends of the tendon had been brought into contact, by moderate flexion of the knee, and complete extension of the foot, Desault used to fill up the hollows, on each side of the tendon, with soft lint and compresses. The roller, applied to the limb, made as much pressure on these compresses, as on the tendon, and hence this part could not be depressed too much against the subjacent parts. Desault next took a compress, about two inches broad, and long enough to reach from the toes to the middle of the thigh, and placed it under the foot, over the back of the leg, and lower part of the thigh. He then began to apply a few circles of a roller round the end of the foot, so as to fix the lower extremity of the longitudinal compress. After covering the whole foot with the roller, he used to make the bandage describe the figure of 8, passing it under the foot, and across the place where the tendon was ruptured, and the method was finished by encircling the limb upward, with the roller, as far as the upper end of the longitudinal compress. (*Desault par Bichat.*)

Certainly this plan seems to answer every object, and may be worthy of being adopted in this country. The continued pressure on the muscles of the calf, by which their action is materially resisted, is too much disregarded by the generality of English surgeons. (Consult *Monro's Works*; *Encyclopédie Méthodique, Article Achille, tendon d', and Mémoire sur la division du tendon d'Achille, in Œuvres Chirurgicales de Desault par Bichat, Tom.* 1. *p.* 306.)

**ACIDUM NITROSUM**, now called by the London College, **Acidum Nitricum**. Dr. Rollo, Mr. Cruickshank, Dr. Beddoes, Mr. Blair, and many others have tried this acid, as a substitute for quicksilver in the cure of the lues venerea. The practice began with Mr. Scott, a surgeon in Bengal, who is said to have caught the idea from Dr. Girtanner, who suggested, that the efficacy of the various preparations of quicksilver might arise from the oxygen, which they contained.

A multitude of cases have been brought forward in favour of nitric acid, as an antisyphilitic; but, there are also some others adduced, which seem very decidedly to controvert its claims to that character. It should be carefully remembered, that it is the *nitric* acid, not the *nitrous*, which seems to deserve a further trial in syphilitic cases.

Mr. Pearson is of opinion, that the power of this medicine has not yet been ascertained in so satisfactory a way as to preclude all difference of opinion on the subject.

Another writer says, that the symptoms of confirmed lues venerea are not removed by nitrous acid; but, that the medicine has been used both liberally and successfully for removing the debilitating effects of mercury, for giving tone to the stomach, improving the appetite, and imparting a granulating and healthy aspect to certain ulcers remaining after a due course of mercury had been tried, and which were aggravated by persevering in the use of the latter medicine. The effects of this acid in syphilis, will be more particularly noticed, in the article *Venereal Disease.*

Nitrous acid, given in doses of eight, ten, or fifteen drops, two, or three times a day, is said to have proved particularly efficacious in the cure of some eruptive complaints, especially of the lower extremities, and joined with disorder of the liver. (*Wilson's Pharm. Chirurgica, p.* 6.)

The common way of giving the nitric acid, at first, is to mix ʒj with a pint of distilled water, the mixture being sweetened with simple syrup. This quantity is to be drank, at different times, in the course of 24 hours, through a small glass tube, which is used to keep the teeth from being injured. If no inconvenience is felt, the dose of the acid may be increased to ʒiss, ʒij, and even, in certain cases, to ʒiij.

The acid is said to increase the appetite, and secretion of urine; to cause more or less thirst, a white tongue, sizy blood, and an increase in the actions of the whole system; but nothing like mercurial salivation is produced. It does not agree, however, equally well with all constitutions.

The nitric acid is beneficial both in the *primary* and *secondary* symptoms of the venereal disease; more so, however, in the former. But, in the latter, even mercury itself frequently fails, and proves hurtful, so that the nitric acid suffers no disparagement from this fact. A change is said to be produced on the disease, by the acid, in six or eight days, and a cure very often in little more than a fortnight.

The oxygenated muriate of pot-ash, which contains an immense quantity of oxygen, is said by Mr. Cruickshank, to be more efficacious than the nitric acid in relieving venereal symptoms.

**ACROMION**, (from *αχξον*, the top, and *ωμος*, the shoulder.) The process of the scapula, articulated with the external end of the clavicle, and formed by the anterior and superior projecting part of the spine of the scapula. It is liable to be broken. (See *Fracture.*)

**ACTUAL CAUTERY.** A heated iron formerly much used in surgery for the extirpation and cure of diseases. The instrument was made in various shapes, adapted to different cases, and it was often applied through a cannula, in order that no injury might be done to the surrounding parts. *Actual* cauteries were so called in opposition to other applications, which, though they were not really hot, produced the same effect as fire, and consequently, were named *virtual* or *potential cauteries.*

**ACUPUNCTURE.** (from *acus*, a needle, and *pungo*, to prick.) The operation of making small punctures in certain parts of the body with a needle, for the purpose of relieving diseases, as is practised in Siam, Japan, and other oriental countries, for the cure of headachs, lethargies, convulsions, colics, &c. (See *Phil. Trans. No.* 148.)

**ACUTENACULUM.** (from *acus*, a needle, and *teneo*, to hold.) Heister so denominates the port-aiguille. It is a handle for a needle, to make it penetrate the flesh more easily.

**ADHESIVE INFLAMMATION.**— That kind of inflammation, which makes parts of the body adhere, or grow together. It is the process, by which recent incised wounds are often united, without any suppuration, and it is frequently synonymous with union by the first intention. (See *Union by the First Intention.*)

**ÆGYLOPS**, (from *αιξ*, a goat, and *ωψ*, an eye.) A disease, so named from the supposition that goats were very subject to it. The term means a sore just under the inner angle of the eye.

The best modern surgeons seem to consider the ægylops, only as a stage of the fistula lachrymalis. Mr. Pott remarks, when the skin covering the lachrymal sac has been for some time inflamed, or subject to frequently returning inflammations, it most commonly happens, that the puncta lachrymalia are affected by it, and the fluid, not having an opportunity of passing off by them, distends the inflamed skin, so that, at last, it becomes sloughy, and bursts externally. This is the state of the disease, which is called perfect *aigylops*, or *ægylops.* (*Pott on Fistula Lachrymalis.*)

Ægylops was a very common term with the old surgical writers, who certainly did not suspect, that obstruction in the lachrymal parts of the eye, is so frequently the cause of the sore, as it really is. The skin over the lachrymal sac must undoubtedly be, like that in every other situation, not exempt from inflammation and abscesses; but, we do not find, that sores, unconnected with disease of the lachrymal sac, are so frequent, as to merit a distinct appellation. The term, ægylops is therefore going more and more into disuse, every day.

**ÆRUGO**, (*Subacetas Cupri Impura*) prepared verdigrease is by some used as an application to incipient chancres. Its acting as a caustic, and completely destroying the diseased surface at once, seems to offer a chance of preventing the absorption of the venereal matter, and, consequently, of doing away the necessity of making the patient undergo a salivation. However, it is perhaps never safe to rely solely upon this mode of treatment, without exhibiting mercury, in some form, or another.

Whenever the plan is tried, and it is certainly not an irrational one, as long as the chancre is very small and recent, it is better to employ the argentum nitratum, which is a more active caustic, and for this reason, more sure to destroy the whole surface of the sore.

**AGARIC.** A species of fungus, growing on the oak, and much celebrated formerly for its efficacy in stopping bleeding. (See *Hemorrhage.*)

**AGGLUTINATION.** The union of parts; the adhesion of parts together, by an effusion of coagulating lymph, followed by a communication of vessels.

**AGGLUTINANTS.** Applications employed with a view of giving an opportunity for the opposite surfaces of a wound to adhere and grow together.

**AGO'MPHIASIS.** (from *α*, neg. and *γομφος*, compact). A painful looseness of the teeth.

**AIR.** For an account of the absurd opinions entertained, concerning its entrance into several cavities of the body, and its pernicious effects there, see *Wounds of the Abdomen.*

**ALBUGO**, (from *albus*, white.) A white opacity of the cornea, not of a superficial kind, but affecting the very substance of this membrane. The disease is similar to the leucoma, with which it will be considered. (See *Leucoma.*)

**ALPHONSIN** is the name of an instrument for extracting balls. It is so called from the name of its inventor Alphonso Ferrier, a Neapolitan physician. It consists of three branches, which separate from each other by their elasticity, but are capable of being closed by means of a tube, in which they are included.

**ALUM.** (an Arabic word.) Alum, either in its simple state, or deprived of its water of crystallization, by being burnt, has long been used in surgery. The ingenious author of the Pharmacopoeia Chirurgica remarks, that unless for external use, as a dry powder, the virtues of alum are not improved by exposure to fire. Ten grains of alum made into a bolus with conserve of roses, are given thrice a day at Guy's Hospital, in such cases, as demand powerful tonic, or astringent remedies. In a relaxed state of the urinary passages, or want of power of the sphincter vesicæ, small doses of alum have been found of service.

It is also recommended by Dr. Percival, to counteract the poison of lead. Burnt alum is a mild caustic, and is a principal ingredient in most styptic powders.

**ALVINE CONCRETIONS.** Concretions, formed in the large intestines, and particularly in the rectum, by the accumulation and protracted lodgment of the fecal matter, may occasion an obstinate constipation, which cannot be relieved, without extracting them. Sometimes these concretions of hardened matter include no foreign body; sometimes a biliary calculus serves as a nucleus; while, in numerous instances, they consist entirely of excrementitious matter hardened by the absorption of its liquid part. Men of advanced age and women are the most frequently afflicted. Children and adults, however, are not altogether exempt from the complaint; but, it is seldom met with in them, unless they have favoured its occurrence by swallowing a large quantity of hard indigestible substances, like cherry-stones. Lastly, extraordinary induration of the fecal matter has been noticed in patients, whom some serious disease has confined a long while in bed, lying upon their backs. (*Richerand*, *Nosographie Chirurgicale*, t. 3, p. 433, edit. 4.)

Surgical writers have recorded many instances, in which concretions of various sizes, and producing a series of very bad and even fatal complaints, have been formed round plum and cherry stones in the alimentary canal. The knowledge of the dangerous consequences, which may ensue from swallowing such indigestible bodies, cannot be too extensively diffused; for, it is certain, that this pernicious habit of children and thoughtless persons is by no means uncommon, and must be a more frequent occasion of ill-health, if not of death, than is generally supposed.

The symptoms induced by the lodgment of concretions of the above kind in the bowels are of a formidable description: severe pains in the stomach and bowels, diarrhœa, violent vomitings of blood and mucus, a discharge of thin fetid matter from the rectum, a difficulty of voiding the excrement, an afflicting tenesmus, extreme emaciation, and debility.

That the foregoing account is not at all exaggerated may be seen by a perusal of the cases, and remarks published on the subject by Mr. Charles White, of Manchester, and Mr. Hey, of Leeds.

I shall take the liberty of quoting a case from each of these gentlemen. The first example is one related by Mr. White, shewing the proper mode to be pursued when practicable.

"On March 2, 1762, Dr. Brown desired I would visit J. Parkinson, of Manchester, an out-patient of the infirmary, who had been some time under his care for complaints much resembling nephrytic paroxysms, which the medicines, usual in such cases, had frequently relieved. The night before he had perceived a lump in the rectum, which had brought on a continual tenesmus. I found him extremely emaciated; the sphincter ani very much dilated, with a continual discharge of thin, excrementitious, and very fetid matter. Upon introducing my finger into the anus, I very distinctly felt a large body moveable in the rectum, which I easily took hold of with a pair of forceps, such as are used in lithotomy, and immediately brought away without much difficulty. It was a ball nearly as big as my fist, and, breaking in the extraction, discovered a plum-stone in the centre, which was its nucleus. Upon further examination, I found there was another, which I extracted entire nearly as large as the first. The patient recovered very fast, and in a month's time, was a hearty strong man." (*Cases in Surgery with remarks, &c.*)

The concretions, which form round fruit stones in the intestinal canal, may become so large as to be incapable of passing onward to the rectum, and, of course, occasion fatal complaints. The annexed case, recorded by Mr. Hey, furnishes us with a proof of this remark. "I was permitted (says this practical writer) to examine the body of a boy, whose parents lived at Holbeck, near Leeds, and who had died in an emaciated state, having had long continued pain in the abdomen, attended with frequent attacks of the ileus.

"I found lying in the transverse arch of the colon a concretion, which was become of so great bulk, that it could pass no farther along the course of the intestine. This seemed to have been the sole cause of the boy's death." (*Practical Observations in Surgery*, p. 492.)

Sometimes, patients ultimately get well by voiding the concretions either by vomiting or stool. Mr. Charles White gives us an account of some such instances; in one fourteen concretions on plum-stones were discharged from the anus; in another, twenty-one similar bodies were ejected from the stomach.

The latter gentleman concludes some interesting cases with warning practitioners, and mankind in general, of the great danger of swallowing fruit-stones, and he doubts not, that many persons have lost their lives from this cause, when the disorder had not been understood, but been mistaken for the cholic.

When such concretions are not particularly large and indurated, they sometimes admit of expulsion by doses of castor oil, oleaginous clysters, &c. But, in other instances, their extraction must be attempted, if their situation in the rectum will permit. It may be done with a pair of lithotomy forceps, or with the sort of spoon used for taking fragments of stone out of the bladder. When the contraction of the sphincter ani frustrates the surgeon's design, he is to divide it at its posterior angle. According to Richerand, such a division does not weaken the fibres of this muscle in a perceptible degree, and its paralysis can never originate from this cause. (*Nosogr. Chir. T.* 3, *p.* 434. *Edit.* 4.)

The reader may find the principal information on this subject, in *Cases in Surgery by Charles White, F.R.S.* 1770, *p.* 17. *Philos. Trans. abridged, Vol. V. p.* 256. *et seq. Edinburgh Med. Essays and Observ. Vol.* 1. *p.* 301. *Ibid. Vol.* 5. *p.* 431. *Essays Phys. and Literary, Vol. II. p.* 345. *Dr. Leigh's Natural History of Lancashire, Plate I. fig.* 4. *Practical Observations in Surgery, by W. Hey, F. R. S. p.* 490. *Richerand, Nosographie Chirurgicale, T.* 3, *p.*433. *Edit.* 4. *An interesting case of obstruction in the large intestines, by a biliary calculus, is related by Mr. Thomas, in Medico-Chirurgical Transactions, Vol. VI. p.* 98.

**AMAURO'SIS.** (from *αμαύροω* to obscure). Frequently called, *Gutta Serena.* This is a disease of the eye, attended with a diminution, or total loss of sight, and arising from a paralytic affection of the retina and optic nerve.

The symptoms of amaurosis are noted for being extremely irregular, and the diagnosis of the disease is often much more difficult, than is commonly supposed, when there is no visible defect in the eye, and we have nothing more than the patient's assurance, that he has lost the faculty of seeing things. In many cases the pupil is very much dilated, immoveable, and possesses its natural black colour, and usual transparency. It cannot be denied, that this is the state of numerous cases; but, it is equally true, that there are many exceptions. Sometimes, in the most complete and incurable cases, the pupil is of its proper size, and even capable of very free motion; and, occasionally, it is actually smaller, and more contracted, than natural. We have the authority of Richter for asserting, that in particular instances, the iris not only possesses a power of motion, but is capable of moving with uncommon activity, so that, in a very moderate light, it will contract in an unusual degree, and nearly close the pupil. (*Anfangsgrunde der Wundarzneykunst, Band.* 3. *p.* 424, *Edit.* 1795.)

Two or three remarkable instances of the active state of the iris, in cases of amaurosis, were once shewn to me by Mr. Albert, then staff surgeon of the York Hospital, Chelsea, and I have seen some other similar cases in St. Bartholomew's Hospital. The patients alluded to, had most of them not the least power of distinguishing the difference, between total darkness, and the vivid light of the sun, or a candle placed just before their eyes. Janin and Richter have seen the pupil capable of motion, in this disease, and Schmucker has twice seen the same fact.

From the various conditions of the pupil, in different cases of gutta serena, no conclusions, entitled to much confidence, can even be drawn, with regard to the particular nature and character of the complaint. For instance, the moveable or immoveable state of the pupil can neither be considered, as a favourable, or unfavourable circumstance Sometimes an amaurosis may be cured, which is attended with a pupil extraordinarily dilated, and entirely motionless. Sometimes, the disorder proves incurable, notwithstanding the pupil is of its proper size, and capable of motion. There are likewise examples, in which the pupil recovers its moveableness, in the course of the treatment, although nothing will succeed in re-establishing the sight. (*Richter, Op. cit. p.* 425.)

The pupil of an eye, affected with amaurosis, (says this experienced surgeon) seldom exhibits the clear shining blackness, which is seen in a healthy eye. In general it is of a dull, glossy, hornlike blackness, which symptom alone is frequently enough to apprise a well-informed practitioner of the nature of the disease. Sometimes the colour of the pupil has an inclination to green; while, in other examples, this aperture seems to be dense, white, and cloudy, so that the complaint might easily be mistaken for the beginning of a cataract. This error, into which inexperienced surgeons are liable to fall, may readily be avoided by attention to the following circumstances. The misty appearance is not situated close behind the pupil, in the place of the crystalline lens; but, frequently, is manifestly deeper in the eye. Nor is it in proportion to the impairment of sight, the patient being quite blind, while the misty appearance is so trivial, that, if it arose from the opacity of the crystalline lens, it could at most only occasion a slight weakness and obscurity in vision. It must be acknowledged, that it is more difficult to avoid mistake, when a beginning amaurosis is accompanied with this cloudiness in the eye, and, consequently, when the degree of blindness seems to bear some proportion to the degree of mistiness in the pupil. However, in this case, if we are to credit the observations of Richter, the true nature of the disease may generally be known, by considering, that though the patient's sight is weak, it is not rendered faulty by an appearance of mist before the eyes, which latter circumstance is always complained of by persons, who are beginning to be afflicted with cataracts; not to mention, that there are usually present several other symptoms, which exclusively belong to the gutta serena.

Sometimes, the interior of the eye, a good way behind the pupil, seems quite white, and a concave light coloured surface may be observed, upon which the ramifications of blood-vessels can be plainly seen. In particular instances, this white surface extends over the whole back part of the eye; while, in other cases, it only occupies a half, or a small portion of it. This peculiar appearance has been ascribed to a loss of transparency in the retina itself, and a consequent reflection of the rays of light. (*Haller, Element. Physiol. Tom.* 5. *p.* 409.)

There can now be no doubt, that such whiteness behind the pupil must sometimes have originated from the diseased mass, which, in cases of fungus hæmatodes of the eye, grows from the deeper part of this organ, and gradually makes its way forward to the iris, being always attended with total loss of sight.

If we put out of consideration the impairment of vision, a degree of squinting is, according to Richter, the only one symptom, which is inseparable from amaurosis. An obliquity of sight, accompanying the imperfect state of the disease, has also been particularly adverted to by Mr. Hey, of Leeds, (*Med. Observations and Inquiries, Vol.* 5.) The patient, says Richter, not only does not turn either eye towards any object, in such a manner, that the object looked at is in the axis of vision; but, he also does not turn both his eyes towards the same thing. This is alleged to be the only symptom, which we can trust, where implicit confidence should not be put in the mere assurance of the patient, that he cannot see, while all the coats and humours of the eye present their natural appearance. Provided this observation be correct, it must be highly interesting to the military surgeon, amaurosis being a common affliction of soldiers, many of whom, however, endeavour to avoid service by pretending to labour under a disease, which they well know does not necessarily produce any very considerable alteration in the natural appearance of the part affected.

The gutta serena originates with very various symptoms, and in exceedingly different ways. Richter thinks it probable, that this variety, attendant on the beginning of the disease, depends upon some difference in the cause of the complaint, and indicates the propriety of having variety in the modes of treatment. Sometimes, the patient loses his sight quite suddenly; while, in other instances, the power of seeing diminishes so slowly, that months, and even years elapse, before the disease attains the worst degree. Sometimes, the gutta serena commences with several symptoms, which seem to betray an increase of sensibility in the eye, or some irritation affecting this organ. In moderately light places, the patient can discern things very well; but, in a great light, he is not able to see at all. The eye is sometimes so sensible, that a strong light will make it weep and become painful. Patients of this description ought always to wear a shade, however bad their sight may be. Sometimes the gutta serena originates with symptoms of weakness and diminished irritability. The sight is cloudy, and the patient finds that he can see better in a light, than a dark situation. He feels as if some dirt, or dust, were upon his eyes, and is in the habit of frequently wiping them. His power of vision is greater after meals, than at the time of fasting. His sight is always, for a short time, plainer, after the external use of tonic remedies, such as hartshorn, cold water, &c. Richter informs us of a person, who was nearly quite blind, but, was constantly able to see very well, for the space of an hour, after drinking champagne wine. He also mentions a woman, who had entirely lost her sight, who was in the habit of having it restored again, for half an hour, whenever she walked a quick pace up and down her garden. This author likewise acquaints us with the case of a lady, who had been blind for years: but, experienced a short recovery of her sight, on having a tooth extracted.

Sometimes, as Richter observes, the symptoms appear to indicate a preternatural accumulation of the humours of the eye. The patients complain of a tension of the eye-ball, which is often particularly irksome and distressing. Whenever such sensation is experienced, the eyesight becomes weak; and, on the subsidence of this feeling, the patient is again able to see better. The eye-ball feels hard, and occasionally is more or less enlarged, so that the state of the affected organ somewhat resembles that, which takes places in hydrophthalmia. (See *this Word.*) When a cataract is complicated with a gutta serena, the vitreous humour is sometimes found, in operating for the first disease, to be preternaturally thin, the eye being, as it were, in a dropsical state. Sometimes, the blood-vessels of the conjunctive are varicose; the patient sees black specks, netlike appearances, streaks, snake-like figures, &c. It seems as if, in this case, the blood-vessels of the retina and choroides were in the same varicose state, as those of the conjunctiva, so as to make pressure upon the first of these membranes. That the vessels are in reality thus dilated, says Richter, is rendered probable by the bleeding, which is apt to occur in the eye in operating for cataracts, complicated with the gutta serena.

In particular examples, the eye seems to be under the influence of some peculiar irritation. The patients see several objects, which are in motion, and of different colours, more especially, shining, fiery spots, flames, and rays of light. Sometimes, amaurosis arises after violent inveterate ophthalmies, and headachs. Certain patients, before being attacked with the complaint, are repeatedly afflicted with catarrhs, which cease as soon as the gutta serena is formed. According to Richter, the mucous membrane of the nose then becomes unusually dry and free from secretion. Some patients, of this kind, have been known to regain their sight, for a short time, on a copious discharge of mucus spontaneously taking place from the nose. Paying diligent attention to these various circumstances, attending the origin of the disorder, says Richter, will often be of great assistance to the practitioner, in enabling him to select a judicious method of treatment, when all other indications are absent.

The disease commonly makes its attack upon both eyes at once, and even in those occasional instances, in which only one is deprived of sight, the other rarely continues for a long time sound. The disorder generally extends over the whole eye; but, sometimes only a half of the organ is affected; the case being then named *amaurosis dimidiata.* In the first example, the patient is quite blind; in the second, he can discern the half of objects. Sometimes the malady seems to be confined to a single little spot in the eye, in which case, the patient is conscious of having before the retina an immoveable black speck. It is to this particular instance, that some pathologists apply the term, *scotomia.* Also patients, who may be said to be entirely blind, sometimes have a small part of the retina, which is still susceptible of the impression of light, and is usually situated towards one side of the eye. (*Hey, in Med. Observations and Inquiries, Vol.* 5.) Richter mentions, that, in one man, who was, in other respects, entirely bereft of vision, this sensible point of the retina was situated obliquely over the nose, and so small, that it was always a considerable time, before its situation could be discovered: he adds, that it was so sensible, as not only to discern the light, but even the spire of a distant steeple. According to this author, it is the centre of the eye, that seems to be the first and most seriously affected in the gutta serena. Hence, the generality of patients, who have a beginning imperfect amaurosis, can always see objects, laterally situated, better than those, which are immediately before them.

The gutta serena is sometimes an intermittent disorder, making its appearance at regular or irregular intervals. In certain examples, as Richter remarks, the disease prevails at particular times, commonly all day, till a certain hour; or from one day till the next; or at a stated time every month. The attacks of the complaint sometimes take place at indeterminate periods. In particular cases, another morbid affection is associated with the impairment of sight. Richter mentions a man, who became blind at twelve o'clock in the day, when the upper eye-lid used also to hang down in consequence of being affected with paralysis. The attack always lasted twenty-four hours. On the following day, at twelve o'clock, the sight used to return, and the patient then suddenly regained the power of raising the upper eye-lid. He would continue thus able to see for the space of the next twenty-four hours. Whenever he took bark, the disease was regularly doubled; that is to say, the man then alternately remained blind forty-eight hours, and recovered the power of seeing for only twenty-four. In another patient, cited by this experienced surgical writer, the aqueous humour, during the blindness, always became discoloured, whitish, and turbid; but, its transparency regularly returned on the cessation of the attack. According to Richter, the periodical amaurosis commonly depends upon irritation affecting the digestive organs, the stimulus of worms, or irregularity in the menstrual discharge. Sometimes, it is plainly a symptom of a confirmed ague, the patient being attacked with an ordinary intermittent, and blind during each paroxysm; but, always regaining his sight as soon as each fit is over. (See *Richter's Anfangsgrunde der Wundarzneykunst, Band* 3, *Kap.* 14.)

Before treating of the different causes of the gutta serena, it seems proper to describe the ordinary symptoms of the disease. When the patient is first attacked, his sight gradually grows weaker; he feels, as if a gauze, or cobweb, were drawn over his eyes, and imagines he sees a white surface, studded with black specks, which he endeavours to wipe away. By degrees, the pupil of the eye loses its brilliancy, and distends itself much beyond the natural size; and if the patient's eye be closed, the upper eye-lid gently rubbed, and then suddenly opened, in a light place, the pupil will contract very little, or not at all. The sight grows weaker and weaker; spectacles and convex glasses are of no service, and the patient, (generally speaking) sees worse in the open day-light, than in a dark situation. While the patient is at all conscious of the impression of the rays of light, or while a certain power of seeing still continues, the disease is called the *imperfect*, or *incomplete amaurosis;* but, when the patient is wholly insensible of the stimulus of light, the disorder is termed *perfect*, or *complete.*

Schmucker remarks, that, although the *complete* gutta serena is generally a gradual disease, there are cases, in which it comes on quite suddenly, without being preceded by the above-mentioned circumstances. These cases, he says, have frequently fallen under his observation, and been more easy of cure, than when the affliction has taken place in a more gradual way. In such instances, the sight is totally lost, the patient can distinguish no object whatsoever, the pupil of the eye is uncommonly enlarged, and if the eyelid be shut, and then rubbed, and opened in a strong light, the aperture in the iris remains fixed, and incapable of contraction. A lighted candle may be held to the patient's eyes, without exciting sensation. The pupil now loses its shining black gloss, and grows pale, so that a skilful practitioner can perceive the difference, without being close to the patient. Persons, attacked in this manner, usually have an unhealthy and timid look. (See *Schmucker's Vermischte Chirurgische Schriften, Band* 2).

According to Richter, the remote causes of gutta serena may be properly divided into three principal classes, the differences of which indicate three general methods of treatment.

It is alleged, that the first class of causes seem to depend upon an extraordinary plethora and turgidity of the blood-vessels of the brain, or of those of the optic nerves and retinæ, upon which last parts a degree of pressure is thereby supposed to be occasioned. A considerable plethora, especially, when the patient heats himself, or lets his head hang down, will frequently excite the appearance of black specks before the eyes, and sometimes complete blindness. A plethoric person (says Richter), who held his breath, and looked at a white wall, was conscious of discerning a kind of network, which alternately appeared and disappeared with the diastole and systole of the arteries. This phenomenon, it is conjectured, originated from the plethoric state of the vessels of the retina. Boerhaave mentions a man, who always lost his sight on getting tipsy, and regained it on becoming sober.

Richter thinks it likely, that it is in this manner, that the disease is produced, by the suppression of some habitual discharge of blood, by not being bled according to custom, by the stoppage of the menses, and by the cessation of hemorrhage from piles; circumstances, which, if we can give credit to all the accounts of Richter, Scarpa, Schmucker, and other experienced writers on the subject, frequently give rise to the gutta serena. In the same manner, the complaint may be brought on by great bodily exertions, which must determine a more rapid current of blood to the head. Richter informs us of a man, who became blind, all on a sudden, while carrying a heavy burden up stairs. He tells us of another man, who laboured excessively hard, for three days in succession, exerting his strength very much, and who became blind at the end of the third day. Pregnant women, in like manner, are sometimes bereft of their sight during the time of labour. Schmucker has recorded a remarkable instance of this in a strong young woman, thirty years old, and of a full habit. Whenever she was pregnant, she was troubled with violent sickness, till the time of delivery, so that nothing would stop in her stomach. She was bled, three or four times, without effect. Towards the ninth month, her sight grew weak, and for eight or ten days before parturition, she was quite blind. The pupil of the eye was greatly enlarged, but, retained its shining black appearance. She recovered her sight immediately after delivery, and did not suffer any particular complaints. Schmucker assures us, that he has been three times a witness of this extraordinary circumstance. (*Vermischte Chir. Schriften, Band* 2, *p.* 6, *edit.* 1786.) Richter speaks of a person, who lost his sight, during a violent fit of vomiting. Schmucker acquaints us, that it is not uncommon for soldiers, who are performing forced marches in hot weather, to become blind all on a sudden. All great exertions of strength, when the body is plethoric, or heated, or bent forwards with the head in a low posture, are usually attended with some danger of bringing on amaurosis.

The blindness, which follows external injuries of the head, is ranked by Richter among the preceding class of cases. A man, who received a smart box on the ear, says this author, lost his sight on the spot. Richter conceives it probable, that a concussion of the head may sometimes produce an atony of the blood-vestels, giving rise to their dilatation, and consequent pressure on the adjacent nerves: perhaps, it is more likely, that the blow itself actually ruptures them, and produces an effusion of blood. Richter suspects, that the gutta serena, which originates during a violent ophthalmy, or during a severe inflammatory fever, may be of the same nature. He thinks it probable, that persons, who become blind while exposing themselves to the burning sun with their heads uncovered, have their sight impaired in a similar way.

The diagnosis of this first species of the gutta serena is founded on an acquaintance with the preceding remote causes, which are for the most part very evident, as the blindness, which is the consequence of them, follows with remarkable quickness.

The second class of causes are supposed to operate, by weakening either the whole body, or the eye alone, and they indicate the general, or topical use of tonic remedies. In the first case, the gutta serena appears as a symptom of considerable universal debility of the whole system; in the second case, the disease is altogether local. Every great general weakness of body, let it proceed from any cause whatsoever, may be followed by a loss of sight. The gutta serena, if we can give credit to the statement of Richter, has sometimes been the consequence of a tedious diarrhæa, a violent cholera morbus, profuse hemorrhage, and immoderate salivations. He informs us of a dropsical woman, who became blind, on the water being let out of her abdomen. According to the same author, no general weakening causes operate upon the eyes, and occasion total blindness, so powerfully and often, as premature and excessive indulgence in venereal pleasures.

The causes are various, which operate locally in weakening the eyes. Nothing has a greater tendency to debilitate these organs, than keeping them fixed very attentively, for a long while, upon minute objects. But, however long and assiduously objects are viewed, if they are diversified, the eye suffers much less, than when they are all of the same kind. A frequent change, in the objects, which we look at, has a material effect in strengthening and refreshing the eye. The sight is particularly injured by looking at objects with only one eye at a time, as is done with telescopes and magnifying glasses; for when one eye remains shut, the pupil of that, which is open, always becomes dilated beyond its natural diameter, and lets an extraordinary quantity of light into the organ. The eye is generally very much hurt, by being employed in the close inspection of brilliant, light-coloured, shining objects. They are greatly mistaken, says Richter, who think, that they save their eyes, when they illuminate the object, which they wish to see, in the evening, with more lights, or with a lamp, that intercepts and collects all the rays of light, and reflects them upon the body, which is to be looked at. Richter makes mention of a man, who, in the middle of winter, went a journey on horseback, through a snowy country, while the sun was shining quite bright, and who was attacked with amaurosis He speaks of another person, who lost his sight, in consequence of the chamber, in which he lay, being suddenly illuminated by a vivid flash of lightning. A man was one night seized with blindness, while he had his eyes fixed on the moon in a fit of contemplation. Richter also expresses his belief, that a concussion of the head, from external violence, may sometimes operate directly on the nerves, so as to weaken and render them completely paralytic.

The third class of causes consist of irritations, which in some inexplicable way, directly, or, probably, for the most part, directly, affect the optic nerves, and render them insensible of the impression of the light. Most of these irritations are asserted to lie in the abdominal viscera, whence they sympathetically operate upon the eyes. The observations of Richter, Scarpa, and Schmucker, all tend to confirm, that amaurosis more frequently arises from irritation in the gastric organs, than any other cause whatever. It may often be ascertained that patients with amaurosis have suffered much trouble, and long grief, or been agitated with repeated vexations, anger, and other passions, which are supposed to have a great effect in disordering the bilious secretion, and the digestive functions in general. Richter tells us of a man, who lost his sight, a few hours after being in a violent passion, and recovered it again the next day, upon taking an emetic, by which a considerable quantity of bile was evacuated. A woman is also cited, who became blind, whenever she was troubled with what are termed, acidities in the stomach. (See *Anfangsgrunde der Wundarzneykunst, Band* 3, *Kap.* 14.)

The continental surgeons are excessively comprehensive in their ideas of the causes of the gutta serena, and, with many truths, they blend an evident quantity of unestablished conjectures, and palpable absurdities. I believe, it will generally be found, that, when surgical writers assign a multitude of causes for any disease, they deal very much in mere supposition. It would be idle credulity, indeed, to put faith in the assertions concerning the amaurosis being occasioned by the bad treatment of particular fevers, suppressed diarrhœas, the repulsion of eruptive complaints, &c. There is no reason, why a person should not become blind about the time, when another disorder gives way; but, we ought to have some other ground for the doctrines, to which allusion is made, before we can presume to offer them as entitled to confidence.

Worms in the alimentary canal are alleged to be sometimes the cause of amaurosis, and, since a disordered state of the gastric organs is universally acknowledged to be frequently concerned in the production of blindness, we can have no difficulty in conceiving, that worms may likewise have the same effect. Besides gastric irritations, there are some others, which class as causes of this disease. A violent fright, which is considered as being a frequent remote cause of the gutta serena, is supposed by Richter to operate chiefly by irritating the nerves.

The blindness sometimes proceeds from a mechanical kind of irritation. A man received in his right orbit a small shot, which pierced the upper eye-lid, and lodged at the upper part of the socket, between the eye-lid and eye-ball, so that it could be felt externally. Richter adds, that this patient shortly afterwards became blind in the left eye; but recovered his sight in it again, upon the excision of the shot. (*Anfangsgr. der Wundarzn, Band 3, p.* 439.)

Sometimes, says this experienced surgeon, the irritation, exciting amaurosis, seems to have its seat in the mucous membrane of the nose and frontal sinuses. We have already adverted to the unusually dry state of the nostril, that has been suspected of being occasionally conducive to this species of blindness.

The gutta serena is generally difficult of cure. However the degree of difficulty, in relieving the disease varies in different cases, according to the way in which the malady originates, and the nature of the cause.

Professor Scarpa, of Pavia, has given an excellent account of the prognosis in cases of amaurosis. Some of his doctrines, however, founded on the humoral pathology, are hypothetical, and, consequently, are purposely omitted in the following account. It also deserves notice that the case supposed to originate from injury of the supra-orbitary nerve, is not always incurable, as the experience of Hey confirms. (See *Med. Obs. and Inq. Vol. 5.*)

Amaurosis is divided by Scarpa into the *perfect*, or *imperfect*; *inveterate*, or *recent*; and *continued*, or *periodical*.

The *perfect*, *inveterate amaurosis* attended with organic injury of the substance, constituting the immediate organ of sight, says Scarpa, is a disease absolutely incurable. The *imperfect*, *recent amaurosis*, particularly that which is *periodical*, is commonly curable; for, it is mostly sympathetic with the state of the stomach and primæ viæ, or dependent on causes, which though they affect the immediate organ of sight, are capable of being dispersed, without leaving any vestige of impaired organization in the optic nerve, or retina.

When amaurosis has prevailed several years, in persons of advanced age, whose eyesight has been weak from their youth; when it has come on slowly, at first with a morbid irritability of the retina, and then with a gradual diminution of sense in this part, till total blindness was the consequence; when the pupil is motionless, not circular, and not much dilated; when it is widened in such a degree, that the iris seems as if it were wanting, and the margin of this opening is irregular and jagged; and, when the bottom of the eye, independently of any opacity of the crystalline lens, presents an unusual paleness, like that of horn, sometimes partaking of green, and reflected from the thickened retina, the disease may be generally set down as incurable. Cases may be deemed irremediable, which are attended with pain all over the head, and a continual sensation of tightness in the eye-ball, which are preceded by a violent, protracted excitement of the nervous system, and then by general debility, and languor of the constitution, as after masturbation, premature venery, and hard drinking. There is no remedy for cases, connected with epileptic fits, or frequent spasmodic hemicrania; nor for such as are the consequence of violent, long-continued, internal ophthalmia. Cases are incurable, also, when produced by violent concussions of the head, direct blows on the globe of the eye, or a violent contusion, or other injury of the supra-orbitary nerve, and this, whether the disease take place immediately after the blow, or some weeks subsequently to the healing of the wound of the eye-brow. Amaurosis is also incurable, when occasioned by foreign bodies in the eye-ball, lues venerea, or exostoses about the orbit. Lastly, amaurosis is absolutely irremediable, when conjoined with a manifest change in the figure and dimensions of the eye-ball.

On the contrary, all cases of imperfect, recent amaurosis, whether the blindness be total, or partial, are mostly curable, when not produced by causes, capable of contusing or destroying the organic structure of the optic nerve, and retina. This is especially true, when the retina is in some degree sensible to the impression of light. Recent, sudden cases, in which the pupil is not excessively dilated, and its disk remains regular, while the bottom of the eye is of a deep black colour; cases, unaccompanied with any acute, continual pain in the head and eye-brow, or any sense of constriction in the globe of the eye itself; cases, which originate from violent anger, deep sorrow, fright, excessive fulness of the stomach, a foul state of this viscus, general plethora, or the same partial affection of the head, suppression of the menses, habitual bleedings from the nose, piles, &c. great loss of blood, nervous debility, not too inveterate, and in young subjects, are all, generally speaking, curable. Amaurosis is also, for the most part, remediable, when produced by convulsions, or the efforts of difficult parturition; when it arises during the course, or towards the termination of acute, or intermittent fevers; and when periodical, coming on at intervals, such as every day, every three days, every month, &c.

Before entering into the consideration of the treatment of the gutta serena, I shall take this opportunity of noticing a few remarkable circumstances, which are connected with the disease.

It sometimes happens, that, when a patient shuts one eye, he can only half distinguish objects; but, that if he opens both eyes, he sees every thing in its natural form. In this case, according to Schmucker, one eye is sound, and only some fibres of the nerve of sight are injured in the other.

In the gutta serena, which comes on gradually, the patient also sometimes sees double, with both eyes. Some years ago, Schmucker cured a major of hussars, who saw the three lines of his squadron double; and the same surgeon was ordered by the king of Prussia to attend a gentleman, who was afflicted in a similar way. In the opinion of this eminent surgeon, such cases are brought on by a violent distention of the vessels of the choroides, where he thinks, that varices may easily arise, in consequence of the weak resistance of that membrane. In this manner, the filaments of the retina suffer pressure, and the rays of light are broken. Under these circumstances, if prompt assistance be not afforded, total and frequently incurable blindness may be the consequence. Schmucker met with an example of such an irremediable amaurosis, (the only instance in his practice), in a young man, twenty-six years of age. When the patient made application for the advice of the foregoing surgeon, he had been blind a year. Before he lost his sight, he remarked, that, after any violent emotion, his sight at first grew weak, and that objects afterwards appeared double. When his circulation was at all hurried, he saw black spots before his eyes, and, at length, was quite blind. The vessels of the choroides were as large, as if they had been injected with wax, and every kind of surgical assistance proved ineffectual.

I have already adverted to the occasional moveableness of the iris, notwithstanding the insensible state of the retina. Let me next take notice of a case, which sometimes presents itself, and is quite the reverse of this last. The nerves of the iris may be paralytic, while those of sight continue unimpaired. Schmucker tells us, he was acquainted with a woman, whose pupil was uncommonly distended, and totally incapable of motion. Her sight was very weak, and spectacles were of no use to her. She could scarcely discern any thing by day, or in a strong light; but, she could see rather better at night and in dark places. This infirmity of sight depended upon the dilated, paralytic state of the pupil, by which too many rays of light were admitted into the eye; and the reason, why the patient could see better at night, was, because the pupil, in its natural state, always becomes widened and dilated in a dark situation. (See *Vermischte Chirurgische Schriften, Von J. L. Schmucker, Band* 2, *p.* 13, 14.)

### TREATMENT OF AMAUROSIS, OR THE GUTTA SERENA.

Here the first endeavour of the practitioner should be to find out and remove the cause of the disease. This is the surest and best way of proceeding; but, it is worthy of notice, that sight does not invariably return, although the real cause of the blindness has been radically removed. In such cases, the continuation of the loss of sight is ascribed to the torpor of the nerves, which have been for a considerable time without action, and have been impaired by the disease. The practitioner usually prescribes stimulants and tonics, with a view of bringing the nerves into their original state of activity. In other cases, sight returns as soon as the cause of the disease is removed. When it is found impossible to make out any thing, respecting the cause of the disorder; the surgeon should found the curative indications upon the symptoms and appearances, which have taken place in the origin and course of the disease, and from which symptoms some conjectures may be drawn, in regard to the nature of the case. When no appearances of this kind occur, and nothing can be learnt about the cause of the malady, the surgeon must have recourse to such empirical remedies, as extensive experience has shewn to be sometimes truly capable of removing the affection, although an explanation cannot always be given of the manner, in which they operate.

We shall follow Richter, and first treat of that method of cure, which is directed against the causes of the disease, and which, whenever circumstances will admit of its adoption, must be regarded as the most proper and scientific.

In that species of amaurosis, which arises from the first class of causes, namely, from those, which seem to induce the disease, by means of a preternatural fulness and dilatation of the blood vessels of the brain, or eye, the indication is evidently to lessen the quantity of blood, and diminish the determination of it to the head. For this purpose, the patient may be bled in the arm, temporal artery, or foot. This evacuation is to be repeated as often as seems necessary, and it will be better to begin with taking away from twelve to sixteen ounces. We are also advised by Schmucker to apply ten or twelve leeches to the neck and temples. The efficacy of bleeding, in the cure of particular cases of the gutta serena, is strikingly exemplified by numerous well-authenticated observations. Richter informs us of a woman, who, on leaving off having children, lost her sight; but, recovered it again by being only once bled in the foot. A spontaneous hemorrhage from the nose also cured a young woman, who had been blind for several weeks. (*Anfangsgrunde der Wundarzneykunst. Band* 3, *p.* 442.)

General bleeding sometimes proves ineffectual, unless assisted by topical. Leeches may be applied to the temples, or cupping glasses to the back part of the neck. When the disorder seems to be connected with an interruption of the menses, or the cessation of bleeding from piles, leeches may be put on the perinæum, the inside of the thigh, or the sacrum. Local bleeding, however, seldom avails, except the whole mass of blood has been previously diminished by a prudent employment of the lancet. Besides bleeding, the surgeon may advantageously have recourse to other means at the same time, as, for instance, emollient glysters, purgatives, blisters, bathing the feet in warm water, &c.

In some cases all the foregoing means fail in producing the desired benefit, even when they have been followed up, as far as the state of the pulse, and strength of the constitution will allow. Here the continuance of the disease may depend, either upon the stoppage of some wonted evacuation of blood, or else upon some other cause of the first class. In the first of these cases, (says Richter) experience shews, that the disease will sometimes not give way, before the accustomed discharge is re-established, on which the malady depends, notwithstanding evacuants may be employed in any way whatsoever. A woman, who (as this author acquaints us) had lost her sight, in consequence of a sudden suppression of the menses, did not recover it again till three months after the return of the menstrual discharge, notwithstanding every sort of evacuation was tried. He also tells us of another woman, who had been blind half a year, and did not menstruate, and to whose external parts of generation leeches were several times applied. As often as the leeches were put on, (says Richter) the menses in part recommenced; and, as long as they made their appearance, which was seldom above two hours, the woman always enjoyed a degree of vision. (*Anfangsgrunde der Wundarzneykunst, Band* 3, *p.* 443.)

For the amaurosis, arising from suppression of the menses, Scarpa recommends leeches to the labia pudendi, bathing the feet in warm water, and afterwards exhibiting an emetic, and the resolvent pills, of which I shall presently speak. If these means fail in establishing the menstrual discharge, he says, great confidence may be placed in a stream of electricity, conducted from the loins across the pelvis, in every direction, and thence repeatedly to the thighs and feet. He enjoins us not to despair at want of success at first, as the plan frequently succeeds, after a trial of several weeks.

For the amaurosis, proceeding from the stoppage of an habitual copious bleeding from piles, Scarpa recommends the application of leeches and fomentations to the hemorrhoidal veins, then giving the patient an emetic, and, afterwards the resolvent pills. (*Saggio di Osservazioni e d'esperienze sulle principali malattie degli occhi, cap.* 19.)

When the disease does not appear to originate from the stoppage of any natural or habitual discharge of blood, and does not yield to the evacuating plan, Richter thinks, that the surgeon is justified in concluding, that the preternaturally dilated vessels have not regained their proper tone and diameter, and that he ought to employ topical corroborant remedies, particularly, cold water. Richter, in this kind of case, is an advocate for washing and bathing the whole head with cold water, especially, the part about the eyes; a method, he says, which may often be practised, after evacuations, with singular and remarkable efficacy.

When the return of sight cannot be brought about in this manner, Richter advises us to try such means, as seem calculated to stimulate the nerves, and remove the torpid affection of the optic nerves in particular. Of these last remedies, says he, emetics are the principal and most effectual. Soldiers, who lose their sight in performing forced marches, in hot weather, very commonly have it re-established again, by being immediately bled, and taking an emetic the next day. (See *Schmucker's Chirurgisch Wahrnehmungen* 1. *Theil.*)

We come now to the consideration of that species of the gutta serena, which is regarded as the effect of some unnatural irritation. Here, according to the precepts delivered by Richter, we should endeavour to discover what the particular irritation is, and then endeavour to effect its removal. When it cannot be exactly detected, we are recommended generally to employ such remedies, as will lessen the sensibility of the nerves, and render them less apt to be affected by the irritation, of whatever kind it may be.

Sometimes the irritation is both discoverable and removable, and still the effect, that is to say, the blindness continues. In this circumstance, Richter thinks, that the surgeon should endeavour to obviate the impression, which the irritation has left upon the nerves, by the use of anodynes, or, else, he is of opinion, that the practitioner should try to remove the torpor of the nerves by the employment of stimulants.

But, according to Schmucker, Richter, and Scarpa, the curable imperfect amaurosis commonly depends on some disease, or irritation, existing in the gastric system, and, in some instances, complicated with general nervous debility, in which the eyes participate. Hence, the chief indication, in the majority of cases, is to free the stomach and primæ viæ from all irritating matter, to strengthen the gastric organs, promote digestion, and reanimate the nervous system in general, and the nerves of the eye in particular.

Emetics and internal resolvents answer the first purpose, and tartar emetic should be preferred to every pharmaceutical preparation. When afterwards administered, in small repeated doses, it also acts as a resolvent remedy, which operation may be rendered stronger by joining it with gummy saponaceous substances.

Dissolve three grains of the antimonium tartarizatum, for an adult, in six ounces of water, and give a spoonful of this solution, every half hour, until nausea and copious vomiting are produced. The next day exhibit some resolvent powders, consisting of an ounce of cream of tartar, and one grain of tartar emetic, divided into six equal parts. The patient must take one of these in the morning, another four hours afterwards, and a third in the evening, for eight or ten days in succession. This remedy will create a little nausea, a few more alvine evacuations, than usual, and, perhaps, in the course of a few days, vomiting. If the patient, during the use of these resolvent powders, should make vain efforts to vomit, complain of bitterness in his mouth, loss of appetite, and no renovation of sight, the emetic, as at first directed, is to be prescribed again. This is to be repeated a third, and fourth time, should the morbid state of the gastric system, the bitter taste in the mouth, the tension of the hypochondria, the acid eructations, and the inclination to vomit, make it necessary. The first emetic often produces only an evacuation of an aqueous fluid, blended with a little mucus; but, if it be repeated, a few days after the resolvent powders have been administered, it then occasions a discharge of a considerable quantity of a yellow, greenish, matter, to the infinite relief of the stomach, head, and eyes.

The stomach having been thus emptied, Schmucker's, or Richter's, resolvent pills are to be ordered.

These are composed as follows:

℞ Gum. Sagapen.
Galban. } an. ʒj
Sap. Venet.
Rhei optim. ʒiss
Tart. Emet. gr. xvi.
Suc. liquorit ʒj fiant pilulæ gran. quinque.

Three of these pills to be taken every morning and evening for a month, or six weeks.

℞ Gum. Ammoniac.
Ass. fœtid.
Sap. Venet. } an. ʒij
Rad. Valer. s. p.
Summit. Arnicæ.
Tart. Emet. gr. xviij. fiant pilulæ gran. quinque.

Six to be taken thrice a day for several weeks.

The pills are here directed to be made larger, than Schmucker and Richter order, that the number in one dose may be diminished. To prescribe 15 pills three times a day would seem absurd to the generality of patients in this country.

The following are the usual effects. The patient, after having vomited copiously, experiences a general calm, and an easiness not felt before. Sometimes, he begins to distinguish the outlines of objects the very day on which he takes the emetic; at other times, he does not reap this benefit till the fifth, seventh, or tenth day; and, in some instances, not before some weeks have elapsed, after the exhibition of the emetic, and the uninterrupted use of the resolvent powders and pills. When the patient begins to recover his sight, the dilated state of the pupil diminishes; the iris contracts more on being exposed to the vivid light of a candle; and, in proportion as the power of seeing things increases, the contraction and moveableness of the pupil augment. On the whole, the cure is very seldom completed in less than a month, during which time the employment of such remedies, as are calculated to revive the languid action of the nerves of the eye, must not be neglected.

When the above plan has rectified the state of the stomach, and partly effected the restoration of sight, such remedies must be employed, as strengthen the digestive organs, and excite the vigour of the nervous system in general, and of the nerves of the eye in particular. A powder is to be prescribed, composed of an ounce of bark, and half an ounce of valerian, divided into six equal parts, one of which is to be taken in the morning, and another in the evening, in any convenient vehicle, for, at least, five, or six weeks. During this time, the patient's nourishment must consist of tender succulent meat, and wholesome broths, with a moderate quantity of wine, and proper exercise in a salubrious air. To excite the action of the nerves of the eye, the vapour of the aqua ammoniæ puræ, properly directed against the eye, is of the greatest service This remedy is applied by holding a small vessel, containing it, sufficiently near the eye to make this organ feel a smarting, occasioned by the very penetrating vapours, with which it is enveloped, and which cause a copious secretion of tears, and a redness, in less than half an hour after the beginning of the applications. It is now proper to stop, and repeat the application, three or four hours afterwards. The plan must be thus followed up till the incomplete amaurosis is quite cured. The ammoniacal vapours should be used as soon as the stomach has been freed from all irritating matter, and they should not be discontinued, till long after the eye has been cured.

The operation of these vapours may be aided by other external stimulants, applied to such other parts of the body, as have a great deal of sympathy with the eyes. Of this kind, are blisters to the nape of the neck; friction on the eye-brow with the anodyne liquor; the irritation of the nerves of the nostrils by sternutative powders, like that composed of two grains of turbith mineral, and a scruple of powdered betony leaves; and, lastly, a stream of electricity. The latter has been proposed, as one of the principal means of curing amaurosis; but, experience has shewn, that electricity only merits confidence, as a secondary remedy, and Mr Hey, one of its most zealous advocates, confesses, that it only succeeds in cases of recent amaurosis, and, usually, not in these, unless it be combined with proper internal medicines, among which resolvents are the chief. (*Med. Obs. and Inq. Vol. 5, p. 26.*)

Many might suppose bark to be a specific for the imperfect periodical amaurosis. This, however, is not the case. Bark, which is efficacious in intermittent fevers, and other periodical diseases, far from curing the periodical amaurosis, seems to exasperate it, rendering its return more frequent, and of longer duration, than before. On the other hand, this disease is most commonly cured, in a very short time, by exhibiting first emetics, then internal resolvents, and lastly, corroborants, and even bark, which was before useless and hurtful.

The above plan of curing the recent imperfect amaurosis succeeds in the majority of cases, when the disease is only sympathetic, or dependent on the morbid state of the gastric system. But, there are cases, in the formation of which many other causes operate, besides the most frequent one already stated. These demand the employment of particular curative means, in addition to those which have been already described. Such is, for example, the imperfect amaurosis, which occurs suddenly, in consequence of the body being excessively heated, or exposure to the sun, or violent anger, in plethoric subjects. This case requires, in particular, general and topical evacuations of blood, and the application of cold washes to the eyes and whole head. An emetic should next be given, and afterwards a purge of the kali tartarisatum, or small repeated doses of the tartar emetic. Schmucker relates, that, by means of bleeding and an emetic, he has oftentimes restored the eye-sight of soldiers, who had lost it in making forced marches, with very heavy burdens. In amaurosis, suddenly occasioned by violent anger, an emetic is the more strongly indicated after bleeding, as the blindness, thus arising, is always attended with a bitter taste in the mouth, tension of the hypochondria, and continual nausea. Richter gives an account of a clergyman, who became completely blind, after being in a furious passion, and whose eye-sight was restored the very next day, by means of an emetic, which was given with a view of relieving some obvious marks of bilious disorder in the stomach.

The treatment of the imperfect amaurosis, from fevers badly treated, deep sorrow, great loss of blood, intense study, and forced exertions of the eyes on very minute, or brilliant objects, consists also in removing all irritation from the stomach, and afterwards strengthening the nervous system in general, and the nerves of the eye in particular. In the case originating from fevers, the emetic and resolvent pills are to be given; then bark, steel medicines, and bitters; while the vapours of the aqua ammoniæ puræ are applied to the eye itself.

When the disorder seems to proceed from grief, or fright, the stomach and intestines are to be emptied by means of tartar emetic, and the resolvent pills; and the cure is to be completed by giving bark and valerian together; by applying the vapour of the aqua ammoniæ puræ to the eye; ordering nourishing easily digestible food; diverting the patient's mind, and fixing it on agreeable objects, and recommending moderate exercise. The amaurosis from fright is said to require a longer perseverance in such a plan, than the case from sorrow. (*Scarpa's Osservaz. Cap.* 19.)

The third species of gutta serena, or that which arises from debilitating causes, is of two kinds; in one, the disease is the consequence of a general weakness of the body; in the other, it is the effect of a debility, which is confined to the eye itself, and does not extend to the whole constitution.

According to Scarpa, the incomplete amaurosis from general nervous debility, copious hemorrhage, convulsions ab inanitione, and long continued intense study, especially, by candle-light, is less a case of real amaurosis, than a weakness of sight from a fatigued state of the nerves, especially of those constituting the immediate organ of sight. When this complaint is recent, in a young subject, it may be cured, or diminished by emptying the alimentary canal with small repeated doses of rhubarb, and then giving tonic cordial remedies. At the same time, the patient must abstain from every thing, that has a tendency to weaken the nervous system, and, consequently, the eye-sight. After emptying the stomach and bowels, it is proper to prescribe the decoction of bark with valerian, or the infusion of quassia, with the addition of a few drops of the æther vitriolicum to each dose, with nourishing, easily digestible food. The aromatic spirituous vapours (mentioned in the article *Ophthalmy*) may then be topically applied; or if these should prove ineffectual, the vapour of the aqua ammoniæ puræ. The patient must take exercise on foot, horseback, or in a carriage, in a wholesome, dry air, in warm weather, and take advantage of sea bathing. He must avoid all thoughts of care, and refrain from fixing his eyes on minute shining objects. In proportion as the energy of the nervous system returns, and the constitution is strengthened, the sight is restored. In order to preserve, and improve this useful sense, the patient must adopt, above all things, every measure, calculated to maintain the tone of the stomach, and moderate the impression of light on the retina. This object can easily be attained by always wearing flat green glasses before the eyes, in a vivid light. (*Saggio di Osservaz. Cap.* 19.)

When the weakness is confined to the eye only, Richter thinks the topical employment of corroborant applications alone necessary. Bathing the eye with cold water, says he, is one of the most powerful means of strengthening the eye. The patient should dip in cold water a compress, doubled into eight folds, and sufficiently large to cover the whole face and forehead, and this he should keep applied, as long as it continues cold. Or, else, he should frequently apply cold water to his eyes and face with his hand, on a piece of rag. In these cases, Richter does not approve of employing eye-glasses; he objects to their smallness, from which the eye soon makes the fluid warm, or presses the greater part of it out.

The eye may also be remarkably strengthened by repeatedly applying blisters of a semi-lunar shape above the eye-brows, only allowing the plaster, however, to remain just long enough to excite redness. Richter likewise speaks favourably of rubbing the upper eyelid, several times a day, with a mixture of the tinctura cantharidum, and spiritus serpilli, great care being taken, that none of the application come into contact with the eye itself. All spirituous and aromatic remedies are also proper. The infusum valerianæ et salviæ, with a proportion of camphorated spirit, and the oleum cajeput are likewise enumerated, as useful and efficacious liniments. (*Anfangsgrunde der Wundarzneykunst, Band* 3, *p.* 452.)

When no probable cause whatsoever can be assigned for the disease, the surgeon is justified in employing such remedies, as have been proved by experience to be sometimes capable of relieving the affection, although upon what principle is utterly unknown. The chief means of this kind are emetics, given in small doses, so as to excite nausea, and occasionally in larger ones to occasion vomiting. A simple solution of two grains of the antimonium tartarizatum in a few ounces of water, taken by spoonfuls, frequently proves productive of remarkable benefit. Experience is also highly in favour of giving a trial to Schmucker's pills, the composition of which has been already described. The operation of these pills may be greatly assisted with the exhibition of arnica and valerian, sixteen grains of which should be taken every morning and evening, and the dose be gradually increased. The leaves and flowers of arnica, in an infusion, or else in powder, have been found efficacious. Of the last, ten grains, which are afterwards gradually increased to half a dram, may be prescribed every two, or every four hours.

Mercury also deserves trial, and its administration may be pushed till the patient begins to be salivated. This mineral may be tried either alone, or in conjunction with other medicines, as sarsaparilla, cicuta, or sulphur auratum antimonii.

Valerian alone, in the form of powder, and in the dose of half a dram, two or three times a day, may also be tried. Or this medicine may be joined with the decoction of bark, containing either some of the ammonia præparata, or a proper proportion of the spiritus ætheris vitriolici compositus. Stork has recommended pulsatilla, in the form of an extract, of which from half a grain to two grains is to be taken with sugar, or antimonial wine; or else an infusion of this plant may be given, The extractum hyoscyami albi is said to be often serviceable, either alone, in the dose of from two to eight grains, or together with antimonial wine. A sort of tincture of millepedes is among the empirical remedies in repute on the continent. Hemlock is another celebrated remedy. So is the powder of belladonna, given in the dose of five grains a day. The ammonia præparata, in the dose of a scruple, once a day, is likewise praised. Externally, the aqua ammoniæ acetatæ, mixed with sage, or setwell tea, has been spoken favorably of, as a collyrium. A mixture of oleum castorei and hartshorn, in equal parts, may be taken inwardly, in the dose of forty drops, and also rubbed upon the upper eyelid and eyebrow. Warner exhibited the oleum animale and musk.

The application of sternutative powders to the nostrils, is, perhaps, to be regarded as a mode of treatment, established on empirical principles, unless, indeed, we can place confidence in the statement of Schmucker and Richter, that an unusual dryness of the mucous membrane of the nose, following tedious and severe catarrhs, may have the effect of inducing amaurosis. The snuff, employed by Schmucker, is thus composed: ℞ Mercur. viv. ʒj. Sacchar. alb. ʒiij, Lill. Alb. Rad. Valerian. ā ā ʒj. Misce.

Mr. Ware has written in favor of the efficacy of electricity and a mercurial snuff in cases of gutta serena. The snuff is compounded of ten grains of turbith mineral (*hydrargyrus sulphuratus*) well mixed, with about a dram of the pulvis sternutatorius, glycirrhiza, or common sugar. A small pinch of this snuff, taken up the nose, is found to stimulate it very considerably—sometimes exciting sneezing, but, in general, producing a very large discharge of mucus.

Mr. Ware has observed, that the pupil has been generally dilated, in the cases benefited by electricity. He notices, however, that there are many instances, in which a contraction of the pupil is the only change, which takes place, in the appearance of the eye. In this sort of case, the impairment of sight is usually preceded by severe pain, and the original cause may be an internal ophthalmy of long continuance. The crystalline is sometimes visibly opaque. Here electricity has been found useful; but, Mr. Ware states, that, in these instances, the sublimate has proved superiorly and more certainly efficacious, and, consequently, he prefers it to all external applications whatever. He recommends 1-fourth of a grain, as a quantity proper for a common dose, and says, that it agrees best with the stomach when first dissolved, as Van Swieten directs, in half an ounce of brandy, and taken in a basin of sago or gruel. For young patients the dose must be diminished in proportion to their youth. The medicine is to be continued, as uninterruptedly as the constitution will allow, for a month, six weeks, or even longer.

Electricity is said to have proved more strikingly useful, in cases of amaurosis, originating from lightning, than when the disease has arisen from any other cause. Mr. Ware relates a most interesting instance of the success of electricity, in a case, which came on very suddenly, after great pain in the teeth, and a swelling of the face, had gone off. The disorder came on more suddenly; the temporary blindness was more entire; the eye-lids were more affected, and the cure more speedy, than in the instances related by Mr. Hey in the 5th vol. of the Med. Obs. and Inq. (*Chirurgical Observations relative to the Eye, by James Ware, Vol.* 1.)

With the exception of one case related by Valsalva, Scarpa was unacquainted with any instance of amaurosis, arising from a wound of the eye-brow, that was relieved, and he has, therefore, set down this species as incurable. The opinion, however, is not perhaps correct, for, the first case related by Mr. Hey arose from this cause, and was cured by giving every night the following dose: ℞ *Calomel.* pp. *Camphor* ā ā iij. *Conserv. Cynosb.* q. s. *probe misceant et f. Bolus*, in conjunction with electricity. The lady, however, had been previously bled twice, had taken some nervous medicines, and had had a blister between the shoulders. The patient was first set upon a stool with glass feet, and had sparks drawn from the eyes, and parts surrounding the orbits, especially, where the superciliary, and infra orbitrary branches of the fifth pair of nerves spread themselves. After this operation had been continued half an hour, she was made to receive, for an equal time, slight shocks through the affected parts. In a few days sight began to return, and in less than three months it was quite restored.—In another case, one grain of calomel, and two of camphor, given every night, and the employment of electricity, effected a cure. The disease had come on gradually, without any previous accident, or pains in the head. The patient a boy nine years old.

There are several other very interesting cases of amaurosis related by Mr. Hey, all of which make electricity appear a most efficacious remedy, though it is true, as Scarpa observes, that, in most of these instances, internal medicines, were also given, and bleeding occasionally practised. Mr. Hey attributes the benefit chiefly to the electricity, because, in two of his cases, no medicines were used, yet the progress of the amendment seemed to be as speedy in them, as in the rest, and in two instances, a degree of sight was obtained by the first application of electricity.

Mr. Hey makes particular mention of an obliquity of sight, as invariably attendant on amaurosis. It was most remarkable in those, who had totally lost the sight of either eye, for, in them, the most oblique rays of light seemed to make the first sensible impression upon the retina; and in proportion as that nervous coat regained its sensibility, the sight became more direct and natural. (*Med. Obs. and Inq. Vol.* 5.)

Many of the causes of amaurosis are of such a nature, as to render the disease totally incurable. Bonetus, in his *Sepulchretum Anatomicum, lib.* 1. *sect.* 18. has given us several such cases: after death, the blindness in one was found to be occasioned by an encysted tumour weighing fourteen drams, situated in the substance of the cerebrum, and pressing on the optic nerves near their origin. In a second, the blindness was produced by a cyst, containing water, and lodged on the optic nerves, where they unite. In a third, it arose from a caries of the os frontis, and a consequent alteration in the figure of the optic foramina. In a fourth, the cause of the disease was, a malformation of the optic nerves themselves. In some of the instances, in which no apparent alteration can be discovered in the optic nerve, Mr. Ware conjectures, whether a dilatation of the anterior portion of the circulus arteriosus may not be a cause of the affection. The circulus arteriosus is an arterial circle, surrounding the sella turcica, formed by the carotid arteries on each side, branches passing from them to meet each other before, and other branches passing backwards, to meet branches from the basilary artery behind. The anterior part of the circulus arteriosus lies directly over, crosses, and is in contact, with the optic nerves, just in the same way as the anterior branches lie over the optic nerves, the posterior ones lie over the nervi motores oculorum. Hence Mr. Ware attempts to refer the amaurosis itself, and the paralytic affection of the eye-lids, and muscles of the eye, sometimes attendant on the complaint, to a dilatation of the anterior and posterior branches of the circulus arteriosus. Dr. Baillie has noticed, in his Morbid Anatomy, the frequently diseased state of the trunk, or the small branches of the carotid arteries at the side of the sella turcica, and he says the same sort of diseased structure is also found in the basilary artery and its branches.

The most valuable information, concerning amaurosis, is to be met with in *Vermischte Chirurgische Schriften von J. L. Schmucker. Band* 2. *Berlin. Edit.* 2. 1786. *Remarks on Ophthalmy, &c. by James Ware. Inquiry into the causes preventing success in the extraction of the Cataract, &c. by the same. Osservazioni sulle Malattie degli Occhi di A. Scarpa. Venez.* 1802. *Hey's Practical Observations in Surgery. Medical Observations and Inquiries, Vol.* 5. *Schmucker's Wahrnehmungen. Richter's Anfangsgrunde der Wundarzneykunst. Band* 3. *Warner's Description of the Human Eye, &c. Chandler's Treatise of the Diseases of the Eye, chap.* 24. *Some scattered remarks in the posthumous work on the diseases of the eye of the late J. C. Saunders, &c.*

Some observations, connected with the subject of *Amaurosis*, will be found in the articles *Cataract, Gutta Serena, Hemeralopia, Hemiopia*, and *Nyctalopia.*

**AMBE.** (*αμβη*, the edge of a rock, from *αμβαινω*, to ascend.) An old chirurgical machine for reducing dislocations of the shoulder, and so called, because its extremity, projects, like the prominence of a rock. Its invention is imputed to Hippocrates. The ambe is the most ancient mechanical contrivance for the above purpose; but, is not at present employed. Indeed, it is scarcely to be met with in the richest cabinets of surgical apparatus. It is composed of a piece of wood, rising vertically from a pedestal, which is fixed. With the vertical piece is articulated, after the manner of a hinge, an horizontal piece, with a gutter formed in it, in which the luxated limb is laid, and secured with leather strings. The patient places himself on one side of the machine; his arm is extended in the gutter, and secured; the angle, formed by the union of the ascending piece, and by the horizontal branch, is lodged in the armpit, and then the horizontal branch is depressed. In this way extension is made, whilst the vertical part makes counter extension, and its superior part tends to force the head of the humerus into its cavity. But, there is nothing to fix the scapula, and the compression made by the superior portion of the vertical piece of the machine, tends to force the head of the humerus into the glenoid cavity, before it is disengaged by the extension. (*Boyer on Diseases of the Bones, Vol. II.*)

**AMBLYOPIA.** (from *αμβλυς*, dull, and *ωψ*, the eye.) Hippocrates means by this word, in his Aph. 31. Sect. 3. the dimness of sight, to which old people are subject. Paulus, Actuarius, and the best modern writers, seem to think, that amblyopia means the same thing as the incomplete amaurosis. (*Encyclopédie Méthodique; Partie Chirurgicale; Art, Amblyopie.*)

**AMMONIÆ MURIAS, AMMONIA MURIATA,** or *Sal Ammoniac.* Its chief use in surgery is as an external discutient application. See *Lotio Ammon. Muriatæ cum Aceto.*

Mr. Justamond recommends the following application for the cure of milk abscesses: ℞ Ammoniæ Muriatæ ℥j. Spiritus Roris marini lbj. Misce. Linen rags are to be wet with the remedy, and kept continually applied to the part affected.

**AMPUTATION.** (from *amputo*, to cut off.) This term signifies the operation of cutting off a limb, or other part of the body, as the breast, penis, &c.

Such an operation frequently becomes indispensably proper, on the principle of sacrificing a branch, as it were, for the sake of taking the only rational chance of saving the trunk itself.

The amputation of the large limbs, was anciently practised under many disadvantages. The ignorance of the old surgeons, in regard to the method of stopping hemorrhage, made many patients die, who had courage to submit to the operation. These practitioners were unacquainted with the mode of healing the wound by the first intention; and their instruments were as awkward and clumsy, as their dressings were irritating and improper.

The best modern practitioners have materially simplified all operations. This object has been greatly promoted, by diminishing the number, and improving the construction of instruments, and by abandoning the use of a multitude of external applications, most of which were useless, or hurtful.

But, much improved as amputation has been, no one can dissemble, that it is an operation at once terrible to bear, dreadful to behold, dangerous in its consequences, and that it leaves the patient for ever afterwards in a mutilated state. Hence, it is the surgeon's duty never to have recourse to so severe a proceeding, without a perfect and well-grounded conviction of the necessity of so doing.

Though we seldom see the operation adroitly executed, its performance is by no means difficult; and the reason of the knife being so badly handled in this part of surgery, may generally be imputed to carelessness, slovenly habits, and fear and confusion on the part of the operator. There are several egregious faults in the method of amputating, which even many hospital surgeons in this metropolis are guilty of; but these we shall find, when we criticise them, are, for the most part, easily avoidable, without any particular share of unusual dexterity. The real difficulty is to ascertain with precision the cases which demand the operation; those in which it may be dispensed with, and to know the exact periods at which it should be practised. These are considerations requiring the most profound attention, and the brightest talents. "The most expert operator (as Mr. O'Halloran observes) may not always be the best surgeon. To do justice to the sick and ourselves, we must, in many cases, rather avoid than perform capital operations. As to amputation itself, that its indiscriminate use, or, indeed, rather abuse, has been of infinitely greater detriment to mankind, than service, must be admitted, &c.

"It was this great propensity to lopping off limbs, that caused a complaint to be exhibited to Louis the 14th, that his surgeons estimated the importance of their service by the number of mutilations only; and they were obliged to defend themselves from this aspersion before a prince, who wisely rated the lives of his subjects too high to suffer characters to be gained at their expence. In fact, it is not enough for a surgeon to know *how* to operate; he must also know *when* to do it." (See *O'Halloran's Treatise on Gangrene and Sphacelus: preface.*)

For such reasons, we shall first take a view of the circumstances, under which, the best modern surgeons deem amputation necessary. However, it may be proper to observe, that, in each of the articles, relative to the particular diseases and injuries, which ever render amputation indispensable, additional information will be offered.

### 1. *Compound Fractures.*

In a compound fracture the necessity for amputation is not altogether proportioned to the seriousness of the accident, but, also, frequently depends on other circumstances. For example, in the field and on board of ship, it is not constantly in the surgeon's power to pay such assiduous attention as the cases demand, nor to procure for the patient the proper degree of rest and stillness. In the field there is often a necessity for transporting the wounded from one place to another. In these circumstances it is proper to have immediate recourse to amputation, in all recent cases of bad compound fractures, the appearances of which are such as necessarily excite apprehension of the consequences. Doubtless, there are many cases, in which it would not be proper to adopt this practice, even under the most unfavourable circumstances of the above description. So, when a compound fracture occurs, in which the soft parts have not been considerably injured; in which the bones have been broken in such a direction that they can be easily set, and kept in their proper position, and in which there is only one bone broken, amputation would be unnecessary and cruel. But, when the limb has been considerably injured, and the bones have been so broken that they cannot be kept in a proper position, after being reduced, we may make it a general rule to amputate, under the circumstances above alluded to.

The bad air in hospitals and large cities, which is always so detrimental to wounds, is another consideration which may render amputation advisable.

In the army, compound fractures of the thigh, produced by gunshot violence, too often have an unfavourable termination, especially when the accident has been caused by a grape, or cannon shot, or even a musket ball, fired from a moderate distance, and the patient is moved from one place to another after the receipt of the injury. In the military hospital at Oudenbosch, in the spring of 1814, I had charge of about eight bad compound fractures of the thigh, of which cases only one escaped a fatal termination. But, all these patients had not merely been struck by grape-shot, or else by balls fired from a short distance, but they had been moved from Bergen-op-zoom into my hospital, five, or six days, after the receipt of the injury, the very worst period possible, on account of the inflammation being then most violent. From the ill success of these cases, many a surgeon, who saw them, might be inclined to think, that immediate amputation ought to be performed for all compound fractures of the thigh without exception. And such is my own sentiment, whenever the accident has been caused in the violent manner above specified, or whenever the patient must be moved any distance in a waggon after the occurrence of the injury. But, I have seen compound fractures of the thigh do well in private practice, and I know of successful cases, where the bone was broken by a pistol ball. I have also heard of many which did well in Spain, but which had the advantage of not being moved from the hospital, where they first rested. I am therefore inclined to believe that the decision for immediate amputation should be made, only when there is reason to apprehend from the nature and force of the shot, that the violence committed is very great, or when the patient cannot have the benefit of perfect stillness, rest, and good surgical assistance. The jolting of a waggon has too often proved fatal to the wounded soldier.

As Mr. Guthrie has accurately observed, one circumstance, which increases the danger of fractures of the femur from gunshot violence, is that the bone is very often broken obliquely, the fracture extending far above and below the point immediately struck by the ball. (*On Gunshot Wounds, p.* 189, 190). In several of the cases, which were under the care of Staff Surgeon Cole and myself in Holland, the bone was split longitudinally, to the extent of seven or eight inches.

"The danger and difficulty of cure, attendant on fractures of the femur from gunshot wounds, (says an experienced writer,) depend much on the part of the bone injured; and, in the consideration of these circumstances, it will be useful to divide it into five parts. Of these, the head and neck included in the capsular ligament, may be considered the first; the body of the bone, which may be divided into three parts, and the spongy portion of the lower end of the bone exterior to the capsular ligament, forming the fifth part. Of these, the fractures of the first kind are, I believe, always ultimately fatal, although life may be prolonged for some time. The upper third of the body of the bone, if badly fractured, generally causes death at the end of six, or eight weeks of acute suffering. I have seen few escape, and then not with a useful limb, that had been badly fractured in the middle part. Fractures of the lower, or fifth division are in the next degree dangerous, as they generally affect the joint; and the least dangerous are fractures of the lower third of the body of the bone. Of these even I do not mean to conceal, that when there is much shattered bone, the danger is great, so that a fractured thigh by gunshot, even without particular injury of the soft parts, is one of the most dangerous kinds of wounds that can occur." (*See Guthrie on Gunshot Wounds, p.* 190.)

But, if in camps, on board of ship, in large cities, and hospitals, it is prudent for the surgeon to perform immediate amputation, in certain cases of bad compound fracture, it may not be right to apply this operation to all such injuries under more favourable circumstances. When the patient can be put into a commodious place, whence it will not be necessary to remove him; when he can be left perfectly quiet, with good air and the aid of skilful surgeons; there are not many cases in which patients enjoying all these advantages, must of necessity submit to amputation. However, if the bones, muscles, and other soft parts, should be so bruised and mangled, that there is no hope of the limb ever being able to perform its functions again, we should not hesitate about performing amputation. An injury, which would, by its inevitable consequences, put the patient's life into the most imminent peril, may often be converted by amputation into one of the most simple nature, and easy of cure. (*Encyclopédie Méthodique, Partie Chirurgicale, Art. Amputation.*)

In compound fractures, there are three points of time when amputation may become proper. The first of these is immediately, or as soon as possible after the receipt of the injury. The second is, when the bones continue for a great length of time without any disposition to unite, and the discharge from the wound has been so long, and is so large, that the patient's strength fails, and general symptoms foreboding dissolution come on. The third is, when a mortification has taken such complete possession of the soft parts of the inferior portion of the limb, quite down to the bone, that upon the separation of such parts, the bone or bones shall be left bare in the interspace.

The first and second of these are matters of very serious consideration. The third hardly requires any.

When a compound fracture is caused by the passage of a very heavy body over a limb; such, for instance, as the broad wheel of a waggon, or loaded cart, or by the fall of a very ponderous body on it, or by a cannon shot, or by any other means so violent as to break the bones into many fragments, and so to tear, bruise, and wound the soft parts, that there shall be good reason to fear, that there will not be vessels sufficient to carry on the circulation with the parts below the fracture, it becomes a matter of the most serious consideration, whether an attempt to save such a limb, will not occasion loss of life. This consideration must be before any degree of inflammation has seized the part, and, therefore, must be immediately after the accident. When inflammation, irritation, and tension have taken place, and when a disposition to gangrene in the limb, has begun to exert its pernicious influence, it is too late; an operation, then, instead of being beneficial, would prove destructive.

The necessity of immediate or very early decision, in this case, makes this a very delicate part of practice; for, however pressing the case may seem to the surgeon, it will not, in general appear in the same light to the patient, to the relations, or to bystanders. They will be inclined to regard the proposition as arising from ignorance, or an inclination to save trouble, or a desire to operate; and it will often require more firmness on the part of the practitioner, and more resignation and confidence on the part of the patient, than is generally met with, to submit to such a severe operation, in such a seeming hurry, and upon so little apparent deliberation; and yet it often happens, that the suffering this point of time to pass, decides the patient's fate.

This necessity of early decision arises from the quick tendency to mortification, which ensues in the injured limb, and too often ends in the patient's death. That this is no exaggeration, melancholy and frequent experience evinces, even in those whose constitutions previous to the accident, were in good order; but much more in those, who have been heated by violent exercise, or labour, or liquor, or who have led very debauched and intemperate lives, or who have habits naturally inflammable and irritable. This is often the case when the fracture happens to the middle part of the bones, but is much more likely to happen, when any of the large joints are concerned. In many of these cases, a determination for or against amputation, is really a determination for or against the patient's existence.

That it would have been impossible to have saved some limbs, which have been cut off, no man will pretend to say; but, this does not render the practice injudicious. Do not the majority of those who get into the above hazardous condition, and on whom amputation is not performed, perish, in consequence of their wounds? Have not many lives been preserved by amputation, which, from the same circumstances, would otherwise most probably have been lost?

Pressing and urgent as the state of a compound fracture may be, at this first point of time, still it will be a matter of choice, whether the limb shall be removed or not; but, at the second period, the operation must be submitted to, or the patient must die.

The most unpromising appearances at first, do not necessarily, or constantly end unfortunately. Sometimes, after the most threatening first symptoms, after considerable length of time, great discharges of matter, and large exfoliations of bone, success shall ultimately be obtained, and the patient shall recover his health and the use of his limb.

But sometimes, after the most judicious treatment through every stage of the disease; after the united efforts of physic and surgery, the sore, instead of granulating kindly, and contracting daily to a smaller size, shall remain as large as at first, with a tawny, spongy surface, discharging a large quantity of thin sanies, instead of a small one of good matter; the fractured ends of the bones, instead of tending to exfoliate, or to unite, will remain as perfectly loose and disunited as at first, while the patient shall lose his sleep, his appetite, and his strength; a hectic fever, with a quick, small, hard pulse, profuse sweats, and colliquative purging, contributing at the same time to bring him to the brink of the grave, notwithstanding every kind of assistance: in these circumstances, if amputation be not performed, what else can rescue the patient from destruction?

The third and last period is a matter which does not require much consideration. Too often the inflammation consequent upon the injury, instead of producing abscess and suppuration, tends to gangrene and mortification, the progress of which is often so rapid, as to destroy the patient in a very short space of time, constituting that very sort of case, in which amputation should have been immediately performed, But, sometimes even this dreadful malady is, by the help of art, put a stop to, but not until it has totally destroyed all the surrounding muscles, tendons, and membranes quite down to the bone, which, upon the separation of the mortified parts, is left quite bare, and all circulation between the parts above and those below, is by this totally cut off. In this instance, whether the surgeon saw through the bare bone, or leave the separation to be effected by nature, the patient must lose his limb. (*See Pott on Amputation.*)

There is yet another circumstance which may render amputation necessary, in cases of compound fractures, and this is, when such copious hemorrhages occur, as cannot be safely stopped by any other means. These bleedings proceed from arteries which have been lacerated by the ends of the broken bone, or some other cause, at the moment of the accident. (*Encyclopédie Méthodique; Partie Chirurgicale, Tom.* 1. *p.* 80.)

Here, however, we should not amputate on account of the bleeding, considered abstractedly; but because it is combined with a bad compound fracture, which puts the limb into such a state as renders it incapable of bearing the operation, which would be requisite for taking up the trunk of the bleeding arteries.

### 2. *Extensive contused and lacerated Wounds.*

These form the second class of general cases requiring amputation. Wounds without fracture, are not often so bad as to require this operation. When a limb, however, has been contused and lacerated, in such a degree, that all its principal blood vessels are injured, and there is no hope of a continuance of the circulation, the immediate removal of the member should be recommended, whether the bones be injured or not. Also, since no effort on the part of the surgeon can preserve a limb so injured, and such wounds are more likely to mortify than any others, the sooner the operation is undertaken the better.

In these cases, as in those of compound fractures, though amputation may not be necessary at first, it may become so afterwards. The foregoing observations, relative to the second period of compound fractures, are equally applicable to wounds, unattended with injury of the bones. Sometimes hemorrhages occur, which we cannot restrain; or a rapid mortification comes on; or such a copious suppuration, as the system cannot bear any longer. (*Encyclopédie Méthodique; Partie Chirurgicale, Tom.* 1, *p.* 80, 81.)

### 3. *Cases in which Part of a Limb has been carried away by a Cannon Ball.*

When part of a limb has been torn off by a cannon ball, or any other cause capable of producing a similar effect, the end of the stump from which the part has been separated, should be removed with a cutting instrument.

This is an instance in which many surgeons dispute the necessity of amputation. They urge as a reason, that the limb being already removed, it is better to endeavour to cure the wound as speedily as possible, than to increase the patient's sufferings and danger, by making him submit to amputation. It must be remembered, however, that the bones are generally shattered, and reduced into numerous fragments; the muscles and tendons are unequally divided, and their ends torn and contused. All allow it is absolutely necessary to extract the splinters of bone, and cut away the irregular extremities of the tendons and muscles, which operations would require a longer time than amputation itself. Besides, we should recollect, that by making the incision above the injured part, so as to be enabled to cover the bone with flesh and integuments, perfectly free from injury, the extent of the wound is so diminished, that the healing can be accomplished in one third of the time which would otherwise be requisite. A much firmer cicatrix is also thus obtained. Such reflections must convince us, that amputation here holds forth very great advantages. It cannot increase the patient's danger, and, as for the momentary augmentation of pain, which he suffers, he is amply compensated by all the benefits resulting from the operation. (*Encyclopédie Méthodique; Partie Chirurgicale, Tom.* 1, *p.* 81.) See *Gun-Shot Wounds.*

### 4. *Mortification.*

Mortification is another cause, which, when advanced to a certain degree, renders amputation indispensably proper. We have noticed, that bad compound fractures, and wounds, often terminate in the death of the injured limb. Such surgeons as, at all events, have been determined to oppose the performance of amputation, have pretended that this operation is totally useless in the present instance. They assert, that when the mortification is only in a slight degree, it may be cured, and that when it has advanced to a considerable extent, the patient will perish, whether amputation be performed or not. But this way of viewing things is so contrary to facts, and the experience of every impartial practitioner, that we shall make no attempt to refute the assertion. Though we allow that it would be very bad practice, every time the slightest appearance of gangrene occurred; yet, when the mischief has increased in such a degree, that all, or the greater portion of the soft parts are gangrenous, as is too frequently the case, there exists no remedy for this state; or, at least, none with which we are acquainted, and amputation is absolutely necessary.

Practitioners have entertained very opposite opinions, concerning the period when one should operate in cases of mortification. Some pretend, that whenever the disorder presents itself, and especially when it is the effect of external violence, we should amputate immediately the mortification has decidedly begun to form, and while the mischief is in a spreading state. Others believe, that the operation should never be undertaken, before the progress of the disorder has stopped, even not till the dead parts have begun to separate from the living ones.

The advocates for the speedy performance of amputation, declare that the further progress of the mortification may be stopped, and the life of the patient preserved, by cutting above the parts affected. Experience, however, has shewn such practice to be highly dangerous, and not deserving of confidence. Whatever pains may be taken in the operation, only to divide sound parts, there is no certainty of succeeding in this object, and the most skilful practitioner may be deceived. The skin may appear to be perfectly sound and free from inflammation, while the muscles which it covers, and the parts immediately surrounding the bone, may actually be in a gangrenous state. But, even when the soft parts are found free from apparent distemper, on making the incision, still, if the operator should not have waited till the mortification has ceased to spread, the stump will almost always be attacked by gangrene. Surgeons, who have had opportunities of frequently seeing wounds which have a tendency to mortify, entertain the latter opinion. Such was the sentiment of Pott, who says, that he has often seen the experiment made, of amputating a limb in which gangrene had begun to shew itself, but never saw it succeed, and it invariably hastened the patient's death.

The operation may be postponed, however, too long. Mr. Samuel Sharp, in particular, recommended too much delay, advising the operation never to be done till the natural separation of the mortified parts had considerably advanced. Mr. Sharp was a surgeon of immense experience, and his authority carries with it the greatest weight. But, perhaps, he was too zealous in his opposition to a practice, the peril of which he had so often beheld. When the mortification has ceased spreading, there is no occasion for further delay. We now obtain, just as certainly, all the benefits of the operation, and get rid of a mass of putridity, the presence of which may become highly pernicious, should the absorbents take up any of the matter into the circulation. However, this danger would not be so considerable as that which would arise from too precipitate an operation; and it is better to defer amputation a little more than is absolutely requisite, than to run any risk of doing it, before being certain that the parts have lost their tendency to gangrene.

In the article, *Mortification*, we have noticed certain cases of gangrene, where according to the experience of M. Larrey, the surgeon is not to wait for the line of separation being formed, but have recourse to the immediate performance of amputation. The experience of Mr. Lawrence has confirmed the propriety of such practice. (*See Medico-Chir. Trans. Vol.* 6. *p.* 156, &c.)

There is also a species of gangrene, which is adverted to by Mr. Guthrie, deputy inspector of military hospitals, as requiring early amputation. "A soldier (says he) shall receive a flesh-wound from a musket ball in the middle of the thigh, which passed through the limb apparently, on a superficial inspection, without injuring the main artery; or it shall pass close behind the femur, where the artery turns to the back part of the bone; or it may go through the middle of the bone, from behind forwards, between the condyles of the femur into the knee-joint, and the patient shall walk to the surgeon with little assistance, be superficially dressed, and, in many cases, considered slightly wounded; yet, the femoral artery, and vein of the whole of these cases, and, indeed, in many others, shall be wounded, or cut across, and the local inflammation be so slight as to obtain little attention. On the third, or fourth day, the patient shews his toes discoloured, and complains of pain and coldness in the limb below the wound, the constitution begins to sympathize with the injury, and the surgeon probably thinks the case extraordinary. Perhaps, he suspects the real state of the injury; but is surprised that a wound of the femoral, or popliteal artery, with so little attendant injury, could cause mortification, &c. He is anxious to do something; but, mortification, or at least gangrene having commenced, he must, according to general rule, await the formation of the line of separation. The temperature of the leg, a little above the gangrene, is good, perhaps higher than natural; he hopes it will not extend farther, and it probably does remain stationary for a little time. At last, the parts originally affected, the toes, become sphacelated, and gangrene quickly spreads up the leg as far as the wounded artery, by which time the patient dies."

To obviate this misfortune, Mr. Guthrie recommends amputation to be done, where the artery, or artery and vein have been divided, as soon as the gangrene is perceived to extend beyond the toes; and the swelling and slight attendant inflammation, which is marked more by the tumefaction, than the redness of the part, has passed higher up, than the ankle. (*See Guthrie on Gunshot Wounds, p.* 60—61.)

### 5. *White-Swellings.*

Scrofulous joints, with diseased bones, and distempered ligaments, is another case, in which amputation may become absolutely necessary. There is one circumstance attending this complaint which often renders it particularly unpleasant, which is, that the subjects are most frequently young children so as to be incapable of determining for themselves, which inflicts a very distressing task on their nearest relations. All the efforts of physic and surgery often prove absolutely ineffectual, not only to cure, but even to retard this most terrible malady. Notwithstanding many cases admit of cure, there are numerous others which do not so. The disease often begins in the very inmost recesses of the cellular texture of the heads of the bones, forming the large articulations, such as the hip, knee, ankle, and elbow; the bones become diseased in a manner, which we shall explain in the article (*Joints*), sometimes with great pain and symptomatic fever; sometimes with very little of either, at least in the beginning. The cartilages covering the ends of these bones, and designed for the mobility of the joints, are totally destroyed; the epiphyses in young subjects are either partially, or totally, separated from the said bones; the ligaments of the joints are so thickened, and spoiled by the distemper, as to lose all natural appearance, and become quite unfit for all the purposes for which they were intended: the parts appointed for the secretion of the synovia, become distempered in like manner; all these together furnish a large quantity of stinking sanious matter, which is discharged either through artificial openings, made for the purpose, or through small ulcerated ones. These openings commonly lead to bones which are diseased through their whole texture. When the disease has got into this state, the constant pain, irritation, and discharge, bring on hectic symptoms of the most destructive kind, such as total loss of appetite, rest, and strength, profuse night sweats, and as profuse purgings, which foil all the efforts of medicine, and bring the patient to the brink of destruction.

It is an incontestable truth, that unless amputation be performed, a patient thus situated must perish; and it is equally true, that numbers, in the same circumstances, have, by submitting to the operation, recovered vigorous health. (See *Pott on Amputation.*)

It is a fact highly important to be known, that, in these cases, amputation is attended with more success, when performed late than when undertaken at an early period before the disease has made great advances This is particularly fortunate, as it affords time for employing such remedies as are at all likely to check the progress of the disorder. (*Encyclopédie Méthodique, Tom.* 1, *p.* 83.) See *Joints—White Swelling.*

### 6. *Exostoses.*

We shall here content ourselves with merely mentioning, that this disease may render amputation necessary, when it is impracticable to remove the bony swelling in the manner we shall explain in the article *Exostosis,* and the tumour becomes hurtful to the health, or insupportable, on account of its weight, or other circumstances.

### 7. *Caries and Necrosis.*

Another distemper, productive of the necessity of amputation, is a caries of a whole bone or bones, forming a limb. A caries is here meant, not merely possessing the surface of such bones, but the whole internal substance, and that from end to end. Bones become carious from a variety of causes, such as struma, lues venerea, deep-seated abscesses, pressure, &c.; and such carious bones, properly treated, often exfoliate and cast off their dead parts. But, when the whole substance of the bone becomes diseased, from end to end, no means will avail. The use of the scalper, the raspatory, and the rugine, for the removal of the diseased surface of bones; of the trephine, for perforating into the internal texture of carious bones, and of exfoliating applications, will not succeed, and, unless the whole bone be removed by amputation, the patient will die. Mr. Pott's refutation of Mr. Bilguer, who asserts that amputation is not requisite in these instances, is a masterly and most convincing production.

Admitting, that internal and external remedies may so alter and correct even the carious part of a bone, as to render it capable of parting with the rest, and becoming sound, yet occasionally there is not time for such experiments, and even in very young subjects, the whole habit is, by the rotten bone, so poisoned and spoiled, that the worst kind of hectic fever will ensue, in spite of bark, and every other specific, in spite of drying, burning, rasping, and boring, and, in a very short space of time, destroy the patient, unless restored by amputation. (See *Caries and Necrosis.*) (*Pott on Amputation.*)

### 8. *Cancerous and other inveterate Diseases, such as the Fungus Hæmatodes.*

Cancerous, inveterate diseases, and ulcers on limbs, sometimes render amputation a matter of necessity. In treating of cancer, we shall remark, that little or no confidence should be placed either in internal or any kind of topical remedies, and that there is nothing, except the total separation of the part affected, upon which any rational hopes of cure can be built. Cancer is not frequently seen in the extremities. Every man of experience, however, must occasionally have seen, in this situation, if not actually cancer, diseases quite as intractable, and which cannot be cured except by removing the affected part. This may often be accomplished without cutting off the whole limb. But, when the disease has spread beyond certain bounds, amputation, above the part affected, is the only thing to which recourse can be had with any hope of success. Sometimes even amputation itself cannot effect a cure, when the operation has been delayed too long. It has succeeded, however, when the disease had reappeared, after a cure had been seemingly achieved by the excision of the diseased parts.

Besides cancerous, there are other ulcers, which may render amputation indispensable. Thus, when an extensive ulcer, of any sort whatsoever, is evidently impairing the health; when, instead of yielding to remedies, it becomes larger and more inveterate; when, in short, it puts life into imminent danger; amputation should be advised. For further information refer to *Cancer, Fungus Hæmatodes, &c.*

### 9. *Various Tumours.*

That there are numerous swellings, which destroy the texture of the limbs, render such members useless, afflict the patient with dreadful sufferings, and bring him into the most debilitated state, no man of observation can fail to have seen. When such tumours can neither be discussed, nor cut out with safety, amputation of the limb is the only resource.

Mr. Pott has particularly described a tumour affecting the leg, for which the operation is sometimes requisite. It has its seat in the middle of the calf of the leg, or rather more towards its upper part, under the gastrocnemius and soleus muscles. It begins by a small, hard, deep-seated swelling, sometimes very painful, sometimes but little so, and only hindering the patient's exercises. It does not alter the natural colour of the skin, at least until it has attained a considerable size. It enlarges gradually, does not soften as it enlarges, but continues through the greatest part of it incompressibly hard, and, when it is got to a large size, it seems to contain a fluid, which may be felt towards the bottom, or resting, as it were, on the back part of the bones. If an opening be made for the discharge of this fluid, it must be made very deep, and through a strangely distempered mass. This fluid is generally small in quantity, and consists of a sanies mixed with grumous blood: the discharge of it produces very little diminution of the tumour, and very high symptoms of irritation and inflammation come on, and advancing with great rapidity, and most exquisite pain, very soon destroy the patient, either by the fever, which is high, and unremitting, or by a mortification of the whole leg. If amputation has not been performed, and the patient dies, after the tumour has been freely opened, the mortified and putrid state of the parts, prevents all satisfactory examination; but, if the limb was removed, without any previous operation, and (which Mr. Pott, in his experience, found to be the only way of preserving the patient's life) the posterior tibial artery, will be found to be enlarged, distempered, and burst; the muscles of the calf to have been converted into a strangely morbid mass; and the posterior part of both the tibia and fibula more or less carious. (*Pott on Amputation.*)

It seems only necessary to adduce another species of tumour to illustrate the necessity of amputation. The following case is related by Mr. Abernethy. A woman was admitted into St. Bartholomew's Hospital with a hard tumour in the ham. It was about four inches in length, and three in breadth. She had also a tumour in front of the thigh, a little above the patella, of lesser size and hardness. The tumour in the ham, by its pressure on the nerves and vessels, had greatly benumbed the sensibility, and obstructed the circulation of the leg, so that the limb was very œdematous. As it appeared impossible to remove this tumour, and as its origin and connexions were unknown, amputation was resolved on. On examining the amputated limb, the tumour in the ham, could only be divided with a saw. Several slices were taken out of it by this means, and appeared to consist of a coagulable and vascular substance, in the interstices of which a great deal of bony matter was deposited. The remainder of the tumour was macerated, and dried, and it appeared to be formed of an irregular and compact deposition of the earth of bone. The tumour on the front of the thigh, was of the same nature as that of the ham, but containing so little lime, that it could be cut with a knife. The thigh bone was not at all diseased, which is mentioned, because when bony matter is deposited in a limb, it generally arises from the disease of a bone. (*Surgical Observations,* 1804.)

Before the late facts and improvements, relative to the treatment of aneurisms, these cases, on the extremities, were generally set down as requiring amputation. Even Mr. Pott wrote in recommendation of such practice, and his observations on this subject are among the few parts of his writings, which the enlargement of surgical knowledge, since his time, has rendered objectionable.

We shall conclude these remarks on the causes requiring amputation, with advising surgeons never to undertake this serious operation, without consulting the opinions of other professional men, when their advice can be obtained.

### *General Remarks on Amputation.*

Although, from the earliest period of human existence, there must have been occasion for performing this operation, we have no decisive proofs in history, that it was ever done by the father of medicine, Hippocrates. A. C. Celsus, who lived in the reign of Tiberius, and whose book, de Re Medica, should be read by every surgeon, has left us a short description of the mode of amputating gangrenous limbs. It has been often remarked, that Celsus has left no instructions for securing the divided blood-vessels; but, it has not been commonly noticed, that, in his chapter on wounds, he directs us to stop hemorrhages by taking hold of the vessels, then tying them in two places, and dividing the intermediate portion. If this measure cannot be adopted, he advises the use of a cauterizing iron. Several hints are to be met with in the writings of Celsus, from which it may be inferred, that the ligature of bleeding vessels was sometimes practised in that early age; and this supposition is strengthened, by a fragment of Archigenes, preserved by Cochius, on the subject of amputation, where he speaks of tying or sewing the blood-vessels. We are not, however, in possession of all the writings of medical authors, prior to the time of Galen, and must therefore remain in doubt upon this point. (*Rees's Cyclopædia, Art. Amputation.*)

The author of the article, referred to, therefore, argues with some appearance of reason, that if amputation often proved fatal in the days of Celsus, "sæpe in ipso opere," as the expression is, it was owing to the want of some efficacious method of compressing the blood-vessels, during the operation itself; for, although the ligature might, perhaps, be employed, they knew not the use of the tourniquet.

But, admitting, that the ancients were not altogether ignorant of the plan of tying arteries, it cannot be credited, that they adopted the practice to any extent, for if they had, they would not have continued so partial to the cautery, boiling oils, and a farrago of astringent applications. They would also never have had recourse to the barbarous method of cutting the flesh with a red-hot knife, with a view of stopping the hemorrhage by converting the whole surface of the stump into an eschar. Painful in its execution, and horrid in its consequence, as this burning operation was, it seldom proved a lasting antidote to the bleeding which generally came on in a fatal manner, as soon as the sloughs were loose. Ambrose Paré, therefore, seems to me to deserve as much praise for the introduction of the ligature into common use, as if no allusions to this method whatsoever had existed in the writings of Celsus and other ancients.

Before the invention of the tourniquet, the operation was attended with so much danger, that very few surgeons ventured to undertake it, and even since the above instrument became known, a long time elapsed before one half of the patients were saved, on whom amputation had been executed. At present, perhaps, not more than one individual out of twenty loses his life after the operation, even taking into the account all those on whom it is practised in hospitals. In private practice, where one can pay greater attention to various important circumstances, which relate to amputation, the proportion of deaths must be still less.

The different parts of the operation, which deserve particular attention, are, the choice of the place where to amputate; the measures for guarding against bleeding during the operation; the division of the integuments, muscles, and bones, which is to be accomplished in such a manner, as to be able afterwards to cover the whole surface of the stump with skin; tying the arteries, which should be done without including the nerves, or any other adjacent part; placing the integuments in a proper position after the operation; and, finally, the subsequent treatment of the wound.

The ancients contented themselves, before making the incision, with having the skin forcibly drawn upward by an assistant; they next divided, with one sweep of the knife, the integuments and flesh down to the bone, and, afterwards, sawed the bone on a level with the soft parts, which were drawn upward. It appears, however, that the views of Celsus extended further than those of most of his contemporaries, and followers, even almost down to modern times. After cutting the muscles down to the bone, he says, that *the flesh should be reflected, and detached underneath with a scalpel, in order to denude a portion of the bone, which is then to be sawn as near as possible to the healthy flesh, which remains adherent.* He states that, when this plan is pursued, *the skin around the wound will be so loose, that it can almost be made to cover the* *extremity of the bone.* It is to be lamented, that this advice, inculcated by Celsus, should not have been comprehended, or that it should have been so neglected, as to stand in need, as it were, of a new discoverer, and that a suggestion of such importance should have remained so long useless. But, the fact is, hemorrhage formerly rendered amputation so dangerous, that the ancient surgeons could not devote much attention to any thing else in the operation, and practitioners amputated so seldom, that we read in Albucasis, that he positively refused to cut off a person's hand, lest a fatal hemorrhage should ensue, and the patient did it himself and recovered.

Ambrose Paré, a French surgeon, who flourished in the 16th century, and to whom we have already alluded, made some important innovations, with regard to the operation of amputation. It is to his industry, good sense and skill, that we are chiefly indebted for the abolition of cauterising instruments, and the general use of a needle and ligature to suppress the bleeding, after the removal of a limb.

An anonymous writer has given the following account of the practice and opinions of this distinguished surgeon, in relation to amputation. "Paré recommended to cut off the whole of the gangrenous part, if the limb be mortified; but, to encroach as little as possible upon the living flesh. At the same time, he laid it down as a rule, not to leave a very long stump to an amputated leg; because the patient could more conveniently make use of a wooden leg, with the stump only five finger breadths long, below the knee, than if much more of the flesh were to be preserved. In the arm, however, he left the whole of the living and healthy portion of the member, only separating the diseased part from the sound.

"In preparing for amputation, he directs the skin and muscles to be drawn upwards, and bound tight with a broad bandage, a little above the part, where the incision is to be made. This fillet was intended to answer a threefold purpose: 1st, to afford a quantity of flesh for covering the bone, and facilitating the cure. 2dly, To close the extremities of the divided blood-vessels. 3dly, To dull the patient's feelings, by pressure on the subjacent nerves. When this firm ligature has been applied, Paré directs an incision to be made down to the bone, either with a common large scalpel, or a curved knife. Then, with a smaller curved knife, we are carefully to divide the muscle, or ligament, remaining between the bones of the fore-arm, or leg; after which, we may proceed to saw off the bone as high as possible, and to emove the asperities, occasioned by the saw.

"With the assistance of a curved pair of forceps, he drew out the extremities of the bleeding arteries, either by themselves alone, or with some portion of the surrounding flesh, to be firmly tied with a strong double thread. He now loosened his bandage, brought together the lips of the wound over the face of the stump, and kept them as close as he could, without actual stretching, by means of four stitches, or sutures. If the larger tied vessels should accidentally become loose, he desires the ligature, or bandage, to be again passed round the limb; or, else, what is better, to let an assistant gripe the limb firm with both hands, and press with his fingers over the course of the bleeding vessel, so as to stop the hemorrhage; then, with a square edged needle, about four inches long, and a thread, four times doubled, the surgeon must secure the artery in the following manner. Thrust the armed needle into the outside of the flesh, half a finger's breadth from the vessel, which bleeds, and bring it out at the same distance from the bleeding orifice; then surround the vessel with the ligature, pass it back again to within one finger's breadth of the place, where it first entered, and tie a fast knot upon a folded slip of linen rag, to prevent its hurting the flesh. By this means, says Paré, the orifice of the artery will be agglutinated to the adjoining flesh so firmly, as not to yield one drop of blood: but, if the hemorrhage were not considerable, he contented himself with the application of astringent powders, &c.

"Thus did this famous surgeon endeavour, by his single example and precepts, to exclude the barbarous use of hot irons in amputation. He says, he knew not of any such practice among the old surgeons; except that Galen recommended us to tie bleeding vessels, towards their origin, in accidental wounds: and he thought proper to do the same in cases of amputation. But, in an apology, at the end of his book, Paré has quoted, in his own defence, a dozen authors, who employed, or recommended the ligature before him; and he might have cited many more.

"From the statement, we have here given, it may be seen, how far our best writers, of every country almost have erred in ascribing the original invention of tying arteries to Ambrose Paré. Great merit, indeed, was due to him, for the part he took in extending, and even reviving this incomparable practice; nay, it is not certain, whether any one before him had ever applied the needle and ligature in similar cases, i. e. after amputation; but, how very wide of the truth, Mr. John Bell's recent account of this matter is, will appear to every person, who will enquire into the facts themselves; for, not only were ligatures and needles in use, among the ancients; but, likewise the tenaculum, or hook to lay hold of the bleeding vessels, when they had buried themselves in the muscles. We refer our inquisitive readers to Avicenna, Ætius, Albucacis, Brunus, Theodoric, Guido di Cauliaco, John de Vigo, Bertapalia, Tagaultius; Petrus Argillata, Andreas a Cruce, &c. &c. where they will find enough to satisfy them on this head." (*Rees's Cyclopædia, art. Amputation.*) See also the article *Hemorrhage*, in this Dictionary.

As Paré, however, like the rest of the old surgeons, used to cut directly down to the bone, many of the stumps, which he made, must have been badly covered with flesh, and ill fitted for bearing pressure. But, all that I have read on the subject of amputation impresses me with a strong conviction, that, in former times, the projection of the end of the bone, the sugar-loaf form of the stump, the frequent exfoliations, and the difficulty in healing the part, and keeping it healed, were more owing to the rude way of dressing the stump, and ignorance of the right method of promoting union by the first intention, than the mode of operating, or any other circumstance.

Cheselden is regarded as the surgeon, who revived Celsus's method, in proposing to divide the soft parts *by a double incision*, that is by cutting the skin and cellular substance first, and then, by dividing the muscles, down to the bone, on a level with the edge of the skin. In this manner the bone could be sawn higher up, and its end could be more completely covered with skin. The wound, however, always continued very large, so that after the amputation of a thigh, three, four, and often five or six months, elapsed before the stump healed. After all, this had a disadvantageous form, being commonly pyramidal, by reason of the projection of the bone beyond the soft parts. A new ulcer was also frequently produced, by an exfoliation of this part of the bone, long after the patient had been deemed quite cured.

To hinder the stump from assuming this pyramidal, or sugar-loaf shape, a circular bandage was employed, which acted by supporting the skin and muscles, and preventing their retraction. This bandage, when properly applied, from the upper part of the limb downward, fulfilled in a certain measure the end proposed, but, never answered well enough to make the wound heal in a reasonable time. Mr. Sharp proposed bringing the edges of the skin together with sutures; but, the pain and other inconveniencies of this method were such, that it was never extensively adopted, and Mr. Sharp himself ultimately abandoned it. It is to be regretted, that a very excellent modern surgeon, Mr. Hey, should have spoken rather in favour of the use of sutures, in bringing together the edges of the wound after amputation. (*Practical Observations in Surgery, p.* 534, *Edit.* 2.)

It appears, from the above account, that our ancestors failed in their endeavours to amputate, so as to shorten the time required for healing the wound, and give the stump a flat, smooth surface. Hence, several surgeons, about forty years ago, endeavoured to revive the method of amputating with a flap, which was practised above a century ago by Lowdham, an Englishman, and was afterwards brought into notice again, at different periods, by M. M. Verduin, Sabourin, Vermale, and La Faye. The plan consisted in preserving a large portion of the muscles and integuments, below the place, where the division of the bone was made, in order to put this flap over the stump, and retain it in this position by a suitable mode of dressing, until an union was accomplished. The operation will be explained hereafter.

The most zealous hopes were always placed in this method, which, to the advantage of defending the end of the stump by a sort of thick fleshy cushion, added that of covering it with perfectly sound skin. But, notwithstanding the exertion of many able men to bring the flap operation to perfection, it has always sunk into disuse. Some surgeons of the present day, however, have not been deterred from further trials to improve the method, while others have endeavoured to perfect the method of amputating with a circular incision. The labours of both the former and latter have not been useless, and, in both ways, by covering the stump with sound skin, the part has often been healed by the first intention, except just where the ligatures of the vessels were situated.

### MR. ALANSON'S MODE OF AMPUTATING.

This gentleman begins his *Practical Observations on Amputation*, with exposing, how useless and inconvenient it was to apply a circular band round the limb, with a view of directing the track of the knife, and giving steadiness to the parts, as was commonly done, before his publication issued from the press.

As soon as the tourniquet is applied, let an assistant grasp the limb circularly with both hands, and firmly draw the skin and muscles upward. The operator must then fix his eye upon the proper part, where he is to begin his operation, and he will now make the circular incision through the skin, and adipose membrane, with considerable facility and despatch, as the knife will pass much quicker, in consequence of the tense state in which the parts are supported. The operator not being obliged to cut in the exact line of the tape, he can also execute this part of the operation, in half the time, which is required in the mode usually practised. The division of the skin being the most painful part of incisions in general, it should always be done as quickly as possible. By drawing up, and supporting the skin and muscles, as here directed, we more fully attain the grand object of preserving as much skin and muscular substance, as will afterwards form a good cushion upon the extremity of the bone.

After the incision, through the integuments, let the assistant still continue a steady support of the parts, then separate the cellular and ligamentous attachments with the point of your knife, till as much skin is drawn up, as will with the united assistance of the particular division of the muscles hereafter recommended, fully cover the whole surface of the wound.

Although a speedy cure may be produced, by covering the wound with skin and adipose membrane only, yet the after consequences are of very material importance in the thigh amputation, and hence the following mode deserves attention, as the parts thus divided, form a thicker cushion over the bone, are much better adapted to immediate contact, union, and the formation of a stump with a regular surface. Hence, after the advised separation of the cellular and ligamentous attachments to the necessary extent, instead of applying the knife close to the edge of the integuments, and dividing the muscles in a circular perpendicular manner down to the bone, proceed as follows. We will suppose you are operating upon the thigh, and standing on the outside of the limb. Apply the edge of your knife, under the edge of the supported integuments, upon the inner edge of the vastus internus muscle, and cut obliquely through that and the adjacent muscles, upwards as to the limb, and down to the bone, so as to lay it bare, about three or four fingers breadth higher, than is usually done, by the common perpendicular circular incision. Now draw the knife towards you, then its point rests upon the bone, and keeping the edge in the same oblique line, already pointed out by the former incision, the rest of the muscles are to be divided in that direction all round the limb, the point of the knife being in contact with, and revolving round the bone through the whole of the division.

The speedy execution of the above directed incision, will be much expedited, by one assistant continuing a firm and steady elevation of the parts, and another attending to preserve the skin from being wounded, as the knife goes through the muscles, at the under part of the limb. Many practitioners next proceed to deprive the bone of its periosteum to a considerable extent, above and below the part, where the saw is to pass, and this they do so minutely, as to consume a considerable time in its execution. This step not only creates unnecessary delay, but, as the periosteum serves to support the vessels in their passage to the bone, is also apt to produce exfoliations, above the part where the bone is to be divided with the saw. Instead of this practice, first apply the retractor, as advised by Gooch and Bromfield, then denude the bone at the part, where you intend the saw to pass, and you will now saw it off higher than is usually practised, which is a material object in preventing a projection of the bone, and forming a small cicatrix.

A stump, formed in the thigh, agreeably to the foregoing plan, (if you bring the parts gently forward after the operation, and then view the surface of the wound,) may be said to resemble, in some degree, a conical cavity, the apex of which is the extremity of the bone: and the parts thus divided, are obviously the best calculated to prevent a sugar-loaf stump.

The part, where the bone is to be laid bare, whether two, three, or four fingers breadth higher than the edge of the retracted integuments; or, in other words, the quantity of muscular substance to be taken out, in making the double incision, must be regulated by considering the length of the limb, and the quantity of skin that has been previously saved by dividing the membranous attachments. The quantity of skin saved, and muscular substance taken out, must be in such an exact proportion to each other, as that by a removal of both, the whole surface of the wound will afterwards be easily covered, and the limb not more shortened, than is necessary to obtain this end.

After the removal of the limb, let each bleeding artery be gently drawn out with the tenaculum, and tied with a common slender ligature, as naked as possible. When the large vessels are tied, the tourniquet should immediately be slackened, and the wound well cleaned, to detect any vessel, that might otherwise lie concealed with its orifice blocked up by coagulated blood; and before the wound is dressed, its whole surface should be examined with the greatest accuracy, by which Mr. Alanson has frequently observed a pulsation, where no hemorrhage previously appeared, and turned out a small clot of blood from within the orifice of a considerable artery. Particular attention, is well bestowed in making every vessel secure, that is likely to bleed on the attack of the symptomatic fever; for besides the fatigue and pain, to which such an accident immediately exposes the patient, the desired union of the wound is also considerably interrupted. The whole surface of the wound must always be well cleaned with a sponge and warm water, as any coagulated blood would be a considerable obstruction to a quick union of the parts.

Let the skin and muscles be now gently brought forwards; fix the flannel circular roller round the body, and carry it, two or three times rather tight round the upper part of the thigh, as at this point, it is intended to form a sufficient basis, that materially adds to the support of the skin and muscles. Then carry it forwards in a circular direction, to the extremity of the stump, not so tight as to press rudely or forcibly, but so as to give an easy support to the parts.

You are now to place the skin and muscles over the bone, in such a direction, that the wound shall appear only as a line across the face of the stump, with the angles at each side, from which points, the ligatures are to be left out, as their vicinity to either angle directs. The skin is easily secured in this posture by long slips of linen, or lint, about two fingers in breadth, spread with cerate, or any cooling ointment. If the skin do not easily meet, strips of sticking plaster are best. These are to be applied from below upwards, across the face of the stump, and over them a soft tow pledget and compress of linen; the whole to be retained with the many-tailed bandage, with two tails to come from below upwards to retain the dressings upon the face of the stump.

Mr. Alanson thinks it very injudicious to raise the end of the stump far from the surface of the bed with pillows, as the posterior muscles become drawn upward by so doing. It is best to raise the stump about half a hand's breadth from the surface of the bed, by which the muscles are put in an easy relaxed position. The many-tailed bandage is much more convenient than the woollen cap, frequently used to support the dressings, though this seems well calculated to answer that purpose: but, if not put on with particular care, the skin is liable to be drawn backwards from the face of the stump, nor can the wound be dressed, without first lifting up the stump to remove the cap.

Mr. Hey thinks the place of the incision through the muscles, the height to which the skin must be retracted, and the place, where the bone must be sawn above the first incision, might all be reduced to determinate measures. A few experiments would enable you to determine precisely, in any limb of given circumference, how many inches the skin must be retracted, &c. and these might be measured by an assistant, if he had little bits of straw, or wood, marked for this purpose. The determination of the proper quantity of skin to be saved will be much assisted by reflecting that the diameter of a circle is a trifle more than one third of its circumference; but, to call it one third will be sufficiently exact for our purpose. Hence, if we perform the flap operation, upon a limb, the circumference of which is nine inches, the flap required to cover this wound must be somewhat more than three inches long; and by the same rule, the quantity of integuments necessary to be preserved to cover a stump of given circumference in any limb, operated upon without the flap, is easily determined.

If the limb be large, the division of the cellular and membranous attachments must be extended in proportion. In emaciated limbs, little more than the oblique turn of the knife to lay bare the bone sufficiently high, will be necessary for the preservation of as much skin, &c. as will cover the wounded surface, and, when practicable, the preference should always be given to the latter mode.

Mr. Alanson used to operate with a double-edged knife, rather smaller, than a common amputation one, than which it is more handy; and being more rounded at the point, than the straight-edged knife, it completes the division of the attachments, and the oblique section of the muscles, more speedily; and, in the whole operation, it has an advantage, that either edge will cut by the slightest turn of the hand. (See *Alanson's Practical Observations on Amputation.*)

### AMPUTATION OF THE THIGH, AS PRACTISED BY THE BEST MODERN SURGEONS.

The thigh ought always to be amputated as low as the disease will allow. The patient is to be placed on a firm table, with his back properly supported by pillows, and assistants, who are also to hold his hands, and keep him from moving too much during the operation. The ankle of the sound limb is to be fastened by means of a garter, to the nearest leg of the table.

The next thing is the application of the tourniquet. (For a description of this instrument see *Tourniquet*). The pad should be placed exactly over the femoral artery, in as high a situation as can conveniently be done. When the thigh is to be amputated high up, it is perhaps better to let an assistant compress the femoral artery in the groin, by any commodious instrument, having a round blunt end, calculated for making direct pressure on the vessel, without injuring the integuments. Were the patient, however, very weak, and unable to bear loss of blood, as there might, in this way, be some bleeding, by reason of the anastomoses with the branches of the internal iliac artery, it would be better to employ the tourniquet if possible. The great objection to the use of this instrument, in amputations of the thigh, is, that it impedes the free and immediate retraction of the loose muscles after they have been cut, the consequence of which is, the surgeon cannot divide so high as he otherwise could do those deeper muscles which are more fixed and attached to the bone. In order, however, to have the bone well covered with flesh, and no danger of a sugar-loaf stump, the latter object is one of infinite importance. I am inclined, therefore, in common cases, to recommend the surgeon to abandon the application of the tourniquet in amputations of the thigh, except where the patient is remarkably weak, so that he cannot bear the smallest loss of blood, and there is no steady intelligent assistant at hand, to whom the compression of the artery in the groin can be prudently confided. Whether the right or left thigh is to be removed, it is customary for the operator to stand on the patient's right side. The great advantage of this situation seems to be, that the surgeon's left hand can be thus more conveniently, and quickly brought into use, than if he were always to stand on the same side, as the limb he is about to amputate. This seems to be the only assignable reason for this habit: for, when the left thigh is to be amputated, it is certainly some inconvenience to have the right limb, between the operator, and the one that is to be removed. But, perhaps, this is less inconvenient than not having the left hand next the wound.

An assistant, firmly grasping the thigh with both hands, is to draw upward the skin and muscles, while the surgeon makes a circular incision as quickly as possible through the integuments down to the muscles. In a thigh of ordinary dimensions, this first incision should be made four inches below where it is intended to saw the bone. When the thigh is bulky, the large amputating knife will be found the best. Before beginning this first cut, the arm is to be carried under the limb, till the knife reaches almost round to the same side on which the operator stands. With one sweep, penetrating to the fascia, the knife is then to be brought round to the point, where it first touched the skin. Thus the wound is more regularly made, than by cutting first on one side, then the other, and the patient is saved some degree of pain, in consequence of the uninterrupted quickness, with which the incision is made.

The cellular substance, connecting the skin, immediately above this wound, with the fascia, is next to be divided all round the limb, till as much skin can be drawn back, as will afterwards conjointly with the muscles, cut in a mode described in the foregoing account of Mr. Alanson's plan, cover the end of the stump with the utmost facility. The detached skin is to be turned up, in order to be out of the way, at the time of cutting the muscles, and sawing the bone. Here it seems useless to repeat the explanation of the division of the muscles, as practised by Mr. Alanson, and still adhered to by the generality of surgeons.

M. Louis, a French surgeon of extraordinary talents, endeavoured to introduce into practice the plan of dividing the loose muscles first, and lastly those, which are closely connected with the bone. This eminent man took notice, that the muscles of the thigh became retracted in an unequal degree, after being divided. Those which are superficial, and extend along the limb, more or less obliquely, without being attached to the bone, were drawn up with greater force, and in a greater degree, than others, which are deeply situated, in some measure, parallel to the axis of the femur, and fixed to this bone throughout their whole length. The retraction begins the very instant, when the muscles are cut, and is not completed till a short time has elapsed. Hence, the effect should be promoted, and be as perfect as possible, before the bone is sawn. M. Louis was always desirous of letting the muscles contract as far as they could in the amputation of the thigh, and, for this reason, he was rather averse to using the tourniquet, as the circular pressure of this instrument counteracted, in some measure, what he wished to take place, and hence he even advised making pressure on the artery by means of an assistant.

Actuated by such principles, M. Louis practised a kind of double incision, different from either Cheselden's, or Alanson's method. By the first wound, he cut, at the same time, both the integuments and the loose superficial muscles; by the second, he divided those muscles, which are deep, and closely adherent to the femur. On the first, deep, circular, cut being completed, M. Louis used to remove a band, which was placed round the limb, above the track of the knife. This was taken off, in order to allow the divided muscles to become retracted without any impediment. He next cut the deep adherent muscles, on a level with the surfaces of those loose ones, which had been divided by the first incision, and which had now attained their utmost state of retraction. In this way, he could evidently saw the bone very high up, and the painful dissection of the skin from the muscles was avoided. M. Louis was conscious, that there was more necessity of saving muscle than skin; he knew, that when an incision is made at once down to the bone, the retraction of the divided muscles always left the edge of the skin projecting a considerable way beyond them. Hence he deemed the plan of first saving a portion of skin, by dissecting it from the muscles, and turning it up, quite unnecessary. The impartial reader, who takes the trouble to read the remarks on amputation, published by this greatest of the French surgeons in the Mem. de l'Acad. de Chirurg. will at once be impressed with the force and perspicuity of the matter, and with the evident propriety of a good deal of the practice inculcated. It gives me pleasure to remark, that many excellent surgeons, whom I have seen operate, do not exactly follow Mr. Alanson's plan of cutting in an oblique manner at once down to the bone, after the integuments have been cut, detached, and reflected; but, so far adopt the principles of M. Louis, as to divide the loose muscles first, immediately after saving the necessary quantity of skin, and, lastly, those, which are intimately attached to the bone throughout their whole extent. This is certainly a better mode of operating, than to follow precisely Mr. Alanson's directions. Candour, however, obliges me to confess, that the attempt to divide the loose muscles first, and then the more fixed ones, is very apt to make an unskilful surgeon cut the whole, or a great part, of the same muscle through more than once; a fault in modern practice, which, as far as my judgment extends, deserves reprobation, as much as any proceeding that can be instanced. To say how unnecessary it is to divide any muscle more than once, is as needless as to remind the reader of its doubling the agony of a very severe operation.

Having cut all the fibres on every side, down to the bone, a piece of linen, somewhat broader than the diameter of the wound, should be torn at one end, along its middle part, to the extent of about eight or ten inches. This is called a retractor, and is applied by placing the exposed part of the bone in the slit, and drawing the ends of the linen upward on each side of the stump. In this manner, the retractor will obviously keep every part of the surface of the wound out of the way of the saw. I have seen this instrument do so much mischief, in consequence of the operator neglecting to use the retractor, that my conscience obliges me to censure such surgeons as are in the habit of employing the saw, without defending the soft parts by this simple contrivance. Some have rejected the use of the retractor, because they have seen it get under the teeth of the saw, and obstruct the action of the instrument; but, this very circumstance adduced against the retraction, is, when considered, the strongest one that could possibly be brought forward in its favour, as the surface of the wound itself, and particularly the edges of the skin, would, in all probability, suffer the same fate as the linen, by getting under the teeth of the saw, if no retractor were employed, in attempting to saw the bone high up, as closely as possible to the soft parts. I think no one can urge any but the most frivolous objections to the use of the retractor, and I know that many who have been with myself eye-witnesses of the mischief frequently done by the saw in amputations, are deeply impressed with an aversion to the neglect of this bandage. I have often seen the soft parts adroitly divided, and I have in these same instances, seen the operators, directly afterwards, lose all the praise which every one was ready to bestow, by their actually sawing through one half of the ends of the muscles together with the bone. Men who have had fortitude not to utter a sigh, nor to let a groan be heard, in the previous sufferings, have now had their involuntary cries extorted from them by unnecessary, unjustifiable torture. But, besides defending the surface of the stump from the teeth of the saw, the retractor will undoubtedly enable the operator to saw the bone higher up than he otherwise could do.

Another proceeding, which seems fit for reprobation, and which, indeed, Mr. Alanson very properly condemned, is the practice of scraping up the periosteum with the knife, as far as the muscles will allow. Nothing seems more probable, than that this may be the cause of the exfoliations which occasionally happen after amputations. At all events, it is a superfluous, useless measure, as a sharp saw, such as ought to be employed, will never be impeded by so slender a membrane as the periosteum. All that the operator ought to do, is to take care to cut completely down to the bone, all round its circumference. Thus a circular division of the periosteum will be made, and upon this precise situation the saw should be placed. (*First Lines of the Practice of Surgery, Edit.* 3.)

But, in no part of the operation of amputation do operators in general display more awkwardness, than in sawing the bone, though perhaps not of that pernicious sort as the errors already noticed. At the time of sawing the bone, much depends upon the assistant who holds the limb. If he should elevate the lower portion of the thigh bone too much, the saw becomes so pinched that it cannot be worked. On the other hand, should he allow the weight of the leg to operate too much, the thigh bone will break before it is nearly sawn through, and its ends will be splintered. It is one of the most common remarks of such persons, as are in the habit of frequently seeing amputations, that the part of these operations, which a plain carpenter would do well, foils the skill of a consummate surgeon, and few operators acquit themselves well in using the saw. Many of them begin the action of this instrument, by moving it in a direction contrary to the inclination of its teeth. Many, seemingly through confusion, endeavour to shorten this part of the operation, by making short, very rapid, and most convulsive strokes, with the saw. Almost all operators fall into the error of bearing too heavily on the instrument. That operator will saw best, who makes the first stroke of the saw, by applying its heel to the bone, and drawing the instrument across the part, towards himself; this makes a slight groove in the bone, which serves very materially to steady the future operations of the instrument; who makes long, regular sweeps with the saw, rather slowly than quickly, rather lightly than heavily. But, there is often a fault in the construction of the saw itself, which impedes its action, quite independently of any fault on the part of the surgeon himself. I allude to not having the edge of the instrument a little broader than its blade. When the saw is well made, the teeth always make plenty of space for the rest of the instrument to move in.

If the bone should happen to break before the sawing is finished, the sharp pointed, projecting spiculæ thus occasioned, must be removed by means of a strong, cutting sort of forceps, termed *bone nippers*.

After the removal of the limb, the femoral artery is to be immediately taken hold of with a pair of forceps, and tied, taking care to leave the accompanying branches of the anterior crural nerve out of the ligature. None of the surrounding flesh ought to be tied, though the ligature should undoubtedly be placed round the artery, just where this vessel emerges from its lateral connections. Mr. Hey has been accustomed to tie the femoral artery twice, leaving a small space between the ligatures, and this method has been constantly used in the Leeds Infirmary. Some reasons against this plan will be found in the article (*Hemorrhage*). The other arteries are usually taken up with a tenaculum. After tying as many vessels as require it, one half of each ligature is to be cut off, near the knot on the surface of the stump. One portion is quite sufficient for withdrawing the ligature when this becomes loose, and the other being only an extraneous body, and productive of irritation and suppuration, should never be allowed to remain. Mr. Alanson directs the ends of the ligatures to be left hanging out at the two extremities of the wound, according as their nearness may point out as best. But when a ligature is situated in the centre of the wound, it is best to bring it out between the strips of adhesive plaster, at the nearest part of the surface; otherwise its running across one half the wound to get at either angle, would create a great deal of unnecessary irritation and suppuration.

During the late war in the Peninsula, there were a few military surgeons in the British service, who made the experiment of cutting off both ends of each ligature close to the knot. The practice has the advantage of allowing every part of the line of the wound a chance of healing by the first intention. My friend, Mr. Lawrence, has also done the same thing in several operations at St. Bartholomew's. (See *Medico-Chirurgical Trans. Vol.* 6, *p.* 156.)

After the battle of Waterloo, it was tried in many cases both by staff surgeon Collier and myself. As I joined the army in the field after nine days, and was therefore obliged to leave my patients at Brussels to the care of others, I lost the opportunity of witnessing the effects of this method. But, from my friend Mr. Collier, I afterwards learned that the new plan and the common one appeared in his judgment to answer about equally well, and he did not therefore attach much importance to the former. When it is tried, single strong threads and silks, or the kind of ligature, which we shall describe in another place, (see *Ligature*) should be employed; for, otherwise the knots will be too large not to create suppuration and future trouble. The army surgeons, who drew up numerous reports to the medical board on this subject, were for the most part unaware of this essential circumstance. The practice has likewise been tried by M. Delpech at Montpelier; but, it is not explained whether he used single threads, or silks, and whether any inconveniences resulted from the method. (See *Relation d'un Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise by P. J. Roux*, 8*vo.* 1815.)

My friend Mr. Downing, deputy inspector of military hospitals, formerly saw this practice tried; but, he informs me, it did not answer, as repeated suppurations and discharges of bits of ligatures followed from time to time, after the patients conceived themselves cured. It merits notice, however, that probably the large thick ligatures in common use some years since, were those employed in the cases alluded to.

Sometimes, the sawn surface of the bone itself bleeds rather profusely. When this happens, it is an excellent plan, which I have often seen my late master Mr. Ramsden and others adopt with the greatest success, to hold a compress of lint over the end of the bone, during the time requisite for securing the rest of the vessels. At the end of this period, the compress may generally be taken away, as the bleeding from the bone will have entirely ceased. As Monro remarks, the surgeon ought not to content himself with tying only such vessels, as he observes throwing out blood, while the patient is faint with pain; he should endeavour to rouse him from that faintish state by a cordial, and then wiping off the coagulated blood with a sponge, wet in warm water, he should examine narrowly all the surface of the stump, otherwise he may expect to be obliged by a fresh hemorrhage to undo all the dressings. (*On Amputation of the Larger Extremities, p. 475. Monro's Works.*)

In the account of Mr. Alanson's plan, we have explained how the wound is to be brought together with strips of sticking plaster. Over these, and the ends of the ligatures, it is best to place some pieces of lint, spread with the unguentum spermatis ceti, to keep them from sticking, which becomes an exceedingly troublesome circumstance, when the dressings are to be removed. I am decidedly averse to the general plan of loading the stump with a large mass of plasters, pledgets, compresses, flannels, &c. I see no reason, why the strips of adhesive plaster, and a pledget of simple ointment, should not suffice, when supported by two cross bandages, and a common linen roller, applied in a circular way, round the limb, from above downward. The first turn of the roller, indeed, should be fixed round the pelvis. The two cross bandages, often called the Malta-cross, are to be put over the end of the stump, one in each diameter. It is also an excellent method to leave some little interspaces between the plasters, and to apply to the linen bandages cold water. In this way, any discharge will readily escape, and the part, being kept cool, will be less disposed to hemorrhage and inflammation.

I am completely of opinion with Mr. Alanson, that the elastic woollen cap, commonly placed over all the bandages and dressings, if not put on with a great deal of care, has a tendency to push the skin backward from the extremities of the stump, and as it must also heat the part very much, its employment ought apparently to be discontinued.

If possible, the dressings should never be removed before the fourth day, not reckoning the one on which the amputation was performed. Monro set down the fifth, sixth, or seventh day, as generally soon enough for this purpose. He allows, however, that, if the smell of the wound should become offensive, the outer dressings may be removed sooner. Even when the dressings are to be taken away, it will frequently be found useful not to remove one strip of plaster; but, the stump must be made clean, and any discharge present washed away. (*Monro*).

At the end of five or six days, the surgeon may begin to try, in a very gentle manner, whether any of the ligatures are loose. However, he should not use the smallest force, nor persist if the trial should create pain. One would hardly try, whether the ligature on the main artery is loose, before the eighth or ninth day.

Though, in the above account, we have directed the edges of the wound, after the amputation of the thigh, to be brought together in such a way, that the wound shall appear as a line across the face of the stump, yet there are instances in which the bone seems most easily and conveniently covered, by making the line of the wound in a perpendicular direction. Mr. Alanson objected to the latter mode, asserting, that the cicatrix afterwards became situated immediately over the end of the bone, the pressure of which was very likely to make the part ulcerate. However, in St. Bartholomew's Hospital, a thigh was, some time since, amputated by Sir L. Harvey, and the edges of the stump were brought together in the perpendicular direction, yet, according to all accounts, a better stump could not have been made. In a case, in which I assisted Mr. Ramsden at Christ's Hospital, when an attempt was made to put up the wound in the common manner, the bone seemed to make considerable pressure against the skin, which did not happen, when the line of the wound was made in the other direction, which of course was immediately adopted. Mr. Hey has noticed this subject as follows: the integuments and muscles may be brought into contact by pressing either the anterior and posterior parts, or the sides of the thigh, together. The former method, by the gradual retraction of the posterior muscles, causes the integuments of the anterior part of the stump to cover more completely the extremity of the bone. The latter method causes the integuments and muscles to meet each other the more readily, and, therefore, is to be preferred, when the quantity of soft parts preserved is somewhat deficient. (*Practical Observations on Surgery, p. 533, edit. 2.*)

The plan of bringing the edges of the wound together, after amputation, so that they may unite by the first intention, has received, for many years past, the universal approbation of British surgeons. It is the general practice in the treatment of all incised wounds. It may be said to be the pride of English surgery; for, in nothing does she display more convincingly her superiority. M. Roux, on his arrival in this country, wondered to see British surgeons so prejudiced in favor of union by the first intention, as to adopt it after all amputations. "*C'est pareillement abuser de la réunion immédiate que de l'appliquer en toute circonstance à la plaie qui résulte de l'amputation* *des membres. J'entends parler de l'amputation dans la continuité des membres et plus particulièrement encore de l'amputation circulaire.*" (P. 128.) M. Roux, however, has curiously omitted to explain in his book, what are the advantages of not bringing the edges of the wound together, and why he calls prejudice the partiality to a method, the superior efficacy of which is continually demonstrated in every hospital of London. He does not indeed presume to condemn the practice altogether; on the contrary, he allows it to be proper in certain cases; but, yet, he contends that it ought to be confined within particular limits. (P. 130.) See, also, *Mem. et Obs. sur la réunion immédiate de la Plaie après l'amputation &c. par M. Roux.*

Richerand informs us, that Dubois at Paris follows the plan with a success equal to that of the London surgeons. For some years past, he has himself also constantly endeavoured to accomplish union by the first intention in all the amputations which he has had occasion to practise, and he succeeds at least in three out of four. "The method is preferable (says he) to the old one, in whatever point of view it is considered. The union is more expeditious, a few days being sufficient for its completion. A woman, whose thigh I took off in 1810, was very well in a week, &c. Besides the advantage of a quicker cure, and such quickness is especially of great importance, where the patient has been much reduced, so that he would hardly be able to bear a long suppuration, union by the first intention has the recommendation of saving the patient from a great deal of pain, the flap of integuments, with which the bleeding surface of the stump is covered, being much less irritating to the flesh, than the softest charpie would be, &c. Three years have elapsed since the publication of the third edition of this book. During this interval, I have performed more than a hundred and fifty amputations, and the utility of immediate union has been more and more proved to me." (*Nosographie Chirurg. p.* 475—477, *edit.* 4.)

But, notwithstanding these and other encomiums on the practice, Richerand, like other French surgeons, is not an advocate for it in certain cases, as, for instance, limbs shattered by gunshot-wounds, or affected with hospital gangrene. Here, he maintains, it hardly ever succeeds. (P. 478). But, though it is true amputations after gunshot-wounds do not generally heal so well, as many other cases, it cannot be denied that they do sometimes unite more or less by the first intention, and why should not the chance be taken? It is productive of no danger; there is nothing better to be tried; and, if it fail, what is the harm? Why, the wound will then heal by suppuration, and the granulating process, just as soon, as if the hollow of the stump had been filled with charpie, or left open; it will in fact now heal in a way, which is less advantageous, than union by the first intention, but which is the best which can now happen.

From what has been said, it appears, that the practice of healing the wound after amputation by the first intention is less general in France, than it is in England; a circumstance which may perhaps be explained by the fact of its being much newer to the French, than to us. Every improvement must encounter for a time the opposition of prejudice; but, one so important as that which we are considering, must at length prevail and meet with universal adoption. Our extraordinary partiality to union by the first intention arises from a conviction of its superior efficacy, and is a decisive proof of the goodness of English surgery in respect to wounds. The observations of Roux and Richerand tend to prove, that they are not altogether unaware of its advantages, and they therefore recommend it for certain cases; but, their backwardness to extend it to all amputations, without exception, is little in favor of the parallel, which they are so fond of advancing between French and English surgery.

### HEMORRHAGE AFTER AMPUTATION.

Bleeding, after the operation, is of two kinds, in regard to the time, when it occurs. The first takes place within twenty-four hours after the operation. Hence, an assistant should always be left with the patient, with directions carefully and repeatedly to look at the stump, and if any bleeding should arise, to apply the tourniquet, until further aid is obtained. In case no assistant can be spared for this purpose, as must frequently happen in country practice, the tourniquet should always be left slackly round the limb, and the nurse, or patient, himself, directed to turn the screw of the instrument, in order to tighten it in case of need. A slack tourniquet left round the limb, after amputation, cannot do harm, and its not having been ready in this way, has cost many patients their lives, as I have known instances of.

This kind of hemorrhage has often been known to arise from the pressure of a tight bandage round the stump. As Monro observes, the circular turns of the bandage, when tight, must stop the return of blood in the cutaneous veins, and by making thus a greater resistance to the blood in the arteries, which anastomose with them, occasion the contracting power of the heart and arteries to dilate, and force more blood into their other branches; but, these being cut in the amputation, will pour out their blood, and so an hemorrhage is brought on. Making much pressure round a stump is highly deserving of reprobation, and whenever there is an universal oozing of blood, be sure, that the circulation in the superficial veins is not impeded by the tightness of the bandage.

If the bleeding should not be from an artery of consequence, the application of linen, dipped in the cold saturnine lotion, will sometimes check it, and the disagreeable necessity for removing the dressings and opening the wound, may thus be avoided.

But it often happens, that the wound must be opened, and the bleeding vessel tied. This is a very painful proceeding to the patient, and when the dressings have been applied some hours, so that the stump has had time to inflame, nothing can exceed the suffering to which the patient is subjected. Here we see the prudence of being particularly careful to tie every suspicious vessel in the first instance.

The second sort of hemorrhage, after amputation, arises from ulceration of the large arteries, and may occur a month after the operation, when the ligatures are all away, and the patient seems nearly well.

Two such cases are related by Mr. Bromfield (Vol. I. p. 307.) This kind of bleeding is less common than formerly, now the plan of covering the stump with sound skin is adopted. When the bleeding vessel is large, there is no chance of putting the patient out of danger, except by cutting down to the vessel, and tying it. The trunk of the vessel can sometimes be more conveniently tied, than the bleeding branch itself.

Mr. Hey makes mention of a particular sort of hemorrhage, after the operation: "I have seen (says he) a few instances of the integuments becoming so contracted after the operation, as to compress the veins just above the extremity of the stump, and bring on after some hours a copious hemorrhage. When it has appeared clear to me, that the hemorrhage was venous, I have made a division of the integuments, on one side of the thigh, sufficient to remove the stricture, and this method has immediately suppressed the hemorrhage." (P. 530, edit. 2.)—I shall make another extract from this interesting author on the present subject.

"When we are under the necessity of amputating a limb, that has suffered great contusion, though the operation is performed upon a part apparently sound, the wound sometimes becomes sloughy and ill conditioned. No good granulations arise to cover the extremities of the arteries; but the ligatures cut through these vessels, or becoming loose, cease to make a sufficient pressure upon them, and hence repeated hemorrhages ensue. This is a dangerous state for a patient; for, if the vessels are taken up afresh with the needle, the hemorrhage will now and then return in the course of two, or three days. In such cases, the application of dry sponge, cut transversely, as directed by Mr. White (*Cases in Surgery)*, has been found singularly useful, and has saved the life of the patient. But, a constant pressure must be kept upon the pieces of sponge, by the fingers of a succession of assistants, till granulations begin to arise upon the stump, and the prospect of future hemorrhage disappears. This method is of the greatest importance after amputation on the thigh, or leg, where the great vessels are deeply seated. In the arm, above the elbow, where the vessels are more superficial, the great artery may be taken up, with a portion of muscular flesh, above the surface of the stump, by making first an incision through the integuments. My colleague Mr. Logan, has done this twice within the last year, with complete success, when repeated ligatures, applied in the usual way, had failed."

"In the morbid sloughy state of the stump, above-mentioned, the application of lint, soaked in a liquid, composed of equal quantities of lemon juice and rectified spirit of wine, has been found very advantageous, and has caused it to put on soon a healthy aspect." (*P.* 536, 537, *edit.* 2.)

### ON THE PROTRUSION OF THE BONE AFTER AMPUTATION OF THE THIGH.

It is clearly proved by the observations of M. Louis, that this disagreeable consequence may be easily prevented by taking care to divide the loose muscles first, and (after their complete retraction, which will be favoured by no band of a tourniquet being applied round the limb), by observing to divide with a bistoury the muscles which are adherent to the bone; for instance, the crural muscle, and the point of adhesion of the vasti and triceps at the posterior spine of the femur. By this method the bone may be very easily sawn three finger-breadths higher than it can be, if no attention be paid to beginning with the division of the loose muscles, and concluding with that of such as are more attached to the bone.

The protrusion of the bones will never take place, so long as they are immediately encompassed with the fleshy substance of the muscles: this proposition is incontestable. The state of the skin, whether longer or shorter, conduces nothing to this protrusion; nor will the inconvenience be prevented by drawing the skin upward, and preserving as much of it as possible. (*See Mém. sur la Saillie de l'Os après l'amputa-*

*tion in Mém. de l'Acad. de Chirurgie, tom.* 5, *p.* 273, *edit. in* 12*mo.*)

Having explained, that the surest way of preventing the evil is to save a sufficiency of muscle, especially of that muscular substance which is naturally most near and adherent to the bone, we shall next speak of the mode of relief.

When the end of the thigh-bone protrudes, it of course hinders cicatrization, and becomes itself affected with necrosis. By the process of exfoliation, the dead portion of bone is sometimes thrown off, and a cure follows. But, in general, this desirable change is extremely tedious, and uncertain as to the result, because it frequently happens, that after the piece of bone has separated, the rest yet projects too much, and the stump still continues too conical to heal firmly enough to be capable of bearing the pressure of a wooden leg. When, however, the end of the bone forms only a slight projection, and the stump is not too conical, it is always best to leave it to nature to throw off the redundant exfoliating portion. In the opposite circumstances, the operation of removing all such part of it as cannot be covered by the integuments, is the best thing which can be attempted, and, if well executed, will effect a cure.

This second operation is exceedingly unpleasant to the surgeon, because patients are apt to suspect, with reason, that the first was not properly managed. Let me therefore repeat, that the surest way of avoiding the evil, is to cut the deep muscles rather higher than the superficial ones, by which means the bone will certainly lie within the level of the surface of the divided flesh.

### SPASMS OF THE STUMP.

Spasmodic contractions of the muscles of the stump is another very afflicting occurrence. Such spasms put the patient to the greatest agony, and, in some cases, increase so much as to affect the whole body, and even occasion death. But, this unfortunate affection, which was rather frequent after amputations performed in the ancient manner, is infinitely less so, after the modern improved plans of operating, tying the vessels, and dressing the wound. When, however, it does occur, the stump must be kept from starting, by fastening it to the pillow and bedding, on which it lies, and opium, and camphorated medicines, are to be liberally exhibited. (*Encyclopédie Méthodique, Partie Chirurgicale, Tom.* 1, *p.* 93. *Latta's Surgery, Vol. III. &c.*)

### AMPUTATION BELOW THE KNEE.

In treating of amputation of the thigh, we have remarked, that as much of the limb as possible should be preserved. The longer it is after the operation, the stronger and more useful will it be found. But, when the leg is to be amputated, authors have set it down, as almost an invariable rule, that the operation is to be performed a little way below the knee, even though the disease, for which the limb is removed, may be situated in the foot, or ankle, and would allow the operation to be done much further down. The common practice is to make the incision through the integuments, just low enough to enable the operator to saw the bones, about four inches below the lowest part of the patella. This degree of lowness is necessary, in order not to deprive the stump of that power of motion, which arises from the flexor tendons of the leg continuing undivided. It is alleged also, as a reason for this mode of proceeding, that it is quite sufficient to preserve a few inches of the leg, in order to afford the body a proper surface of support, in walking with a wooden leg, whereas if a larger portion were saved, the superfluous part would be a great inconvenience both in walking, and sitting down, without being of the smallest utility, in any respect whatever.

The tourniquet should be applied to the femoral artery, about two-thirds of the way down the thigh, just before the vessel perforates the tendon of the triceps muscle. This place is much more convenient than the ham. The patient is to be placed upon a firm table, as in the amputation of the thigh, and the leg being properly held by one assistant, while the integuments are drawn upward by another, the surgeon, with one quick stroke of the knife, is to make a circular incision through the integuments all round the limb. Some recommend the operator to stand on the inside of the leg, in order that he may be able to saw both bones at once. No reflections could ever make me perceive, that any real advantage ought strictly to be imputed to this plan. Many suppose this method diminishes the chance of the fibula being splintered, by this bone being completely divided rather before the tibia. But, splintering the bones arises from the assistant depressing the limb too much, or else not supporting it enough. It would be difficult to explain, why the tibia, in this plan, should not be splintered, instead of the fibula, when a certain thickness of it has been sawn through, if the assistant should be guilty of the above mismanagement.

A circular cut having been made through the integuments, about two inches below the place where it is intended to saw the bones, the next object is to preserve skin enough to cover the front of the tibia, and the part of the stump, corresponding to the situation of the tibialis anticus, extensor longus pollicis pedis, and other muscles, between the tibia and fibula, and those covering the latter bone. Throughout this extent, there are no bulky muscles which can be made very serviceable in covering the end of the stump, and consequently, the operator must take care to preserve sufficient skin in this situation, by dissecting it from the parts beneath, and turning it up.

On the back part of the leg, on the contrary, the skin should never be detached from the large gastrocnemius muscle, which, with the soleus, will here form a sufficient mass for covering the stump. Hence, as soon as the skin has been separated in front, and on the outside of the leg, the surgeon is to place the edge of the knife in the division of the integuments behind, and cut directly through the muscles of the calf, from the inner edge of the tibia quite across the fibula, supposing the operator to be on the patient's left side. In performing this last incision, as M. Louis well observes, it will be very useful to incline the edge of the knife obliquely upwards. By this means, the skin will be longer than the muscles, and the cure will be considerably accelerated. *(Mem. de l'Acad. de Chirurgie, Tom. 5, edit. in 12mo.)*

Then the flap formed by the integuments, and muscles of the calf, is to be held back, by one of the assistants, while the surgeon completes the division of the rest of the muscles, together with that of the interosseous ligament, by means of the catling, a kind of long, narrow, double-edged knife.

In amputating below the knee, very particular care must be taken to cut every fasciculus of muscular fibres, before using the saw. Every part, except the bones, being divided, the soft parts are next to be protected from the teeth of the saw, by a linen retractor, made with two slits to receive the two bones.

On the leg, there are only three principal arteries, requiring ligatures, viz. the anterior and posterior tibial, and the peroneal, arteries.

When the soft parts have been cut in the preceding way, the bones sawn, and the arteries tied, the wound is to be closed by bringing the flap of skin over the front and external part of the stump so as to meet the flap composed of the gastrocnemius solæus, and integuments on the opposite side.

Many surgeons, however, operate differently. They first make the circular incision through the skin two inches below where they mean to saw the bones. They next detach the skin from the muscles and bones equally all round the limb to the extent of about a couple of inches. The integuments are then turned up, and a division of the muscles made all round down to the bones, on a level with the line, where the detachment of the skin has terminated. The parts between the bones are afterwards cut through, &c. The hemorrhage having been stopped, the integuments are drawn down over the stump. Here the wound is to be united from before backward, because the greatest diameter of the stump is from without inward. *(Richerand Nosographie Chirurg. T. 4, p. 485-486, edit. 4.)*

Whether the above plan of amputating the leg so high up, when the foot, or ankle, is the part diseased, or injured, be on the whole most advantageous, I cannot presume to determine. There are certainly many clever men who condemn the practice, and though we see it pursued by the best surgeons in this metropolis, yet, we may safely assert, that the matter requires further consideration. If it were a decided point, that the common custom of bending the knee, for the sake of bearing the weight of the body on its anterior part, were the only one admissible, after amputation of the leg, there could be no doubt of the propriety of performing the operation a little way below the knee, in preference to any other situation. But, since there have been numerous instances of persons walking very securely with machines, which allow them to make use of the knee, and are more pleasing to the eye, on account of their perfect resemblance to a natural limb; and since also, the operation at the lower part of the leg, is more easy of performance, and safer, than when done high up; some very eminent surgeons have thought that it ought always to be done near the ankle, when possible, instead of near the knee.

Mr. White of Manchester, in a paper dated 1769, (*Med. Obs. and Inq. Vol. 4.*) informs us, that he took the hint to amputate a little above the ankle, from seeing a case, in which this had been done by a simple incision, with such success, that the patient could walk extremely well, though with a machine, that was very badly constructed. After this Mr. White began to operate above the ankle with the double incision; and he invented a machine much better calculated for the patient to walk upon.

In 1773, Mr. Bromfield published his *Chirurgical Cases and Observations*, wherein he mentions his having begun about the year 1740 to amputate above the ankle, in a case of gangrene of this part of the leg. The patient walked so well, with the aid of a very simple machine, both along a level surface, and in going up and down stairs, that it was difficult to perceive he had lost his foot. Mr. Bromfield was persuaded, however, to give up this practice, until he learned, in 1754, that a Mr. Wright had thrice amputated in this way with success, when he again had recourse to it, without the least unpleasant consequences.

The operation just above the ankle is less painful, because there is not so much substance to be divided, as in the calf. There is also more facility in covering the bone entirely with skin. The wound would generally require less time to heal; its smaller size, and the greater exactness, with which its opposite edges can be brought into contact, are circumstances, which would fully warrant this conclusion, even were the sentiments of experienced men totally out of the question.

The advantage of amputating a little below the knee, is, that pressure in walking with a wooden leg, is entirely confined to the front of the limb, and the cicatrix itself is subjected to no sort of irritation whatever. After amputating at the ankle, the pressure in walking operates directly on the cicatrix; but, if the mechanical contrivances for walking are now brought to such perfection, that this pressure does no harm, the operation should not be abandoned on this account.

According to Sabatier, however, the plan has been tried extensively in France, but it is found not to answer, the stump not being fitted for bearing the pressure and therefore not continuing healed. (*Médécine Opératoire*, s. 3, p. 377, Edit. 2.)

### AMPUTATION WITH A FLAP.

An historical account of the flap amputation was drawn up by the celebrated M. de la Faye, and is inserted in the Memoires de l'Acad. de Chirurgie, Tom. 5, Edit. in 12mo. Being desirous of bringing into this dictionary as much of the valuable matter of those highly admired memoirs, as I conveniently can, I shall now present the reader with some of La Faye's and Garengeot's observations on this subject.

The reflections, made by several surgeons at the end of the 17th century, as well as by those of the present, have induced them to think, that, by preserving a flap of flesh and skin, for covering the stump, the operation would be rendered less painful, more certain, and the cure much quicker. From this portion of flesh, the method of taking off a limb, has been styled the flap-amputation.

It is in the Acta Eruditorum of Leipsic, of the year 1697, that we must search for the epocha of the flap operation. We there find a book quoted, which was written in English, with this Latin title, Currus triumphalis ex Terebinthina, published in 1679, by Jacob Young, an English surgeon, with the extract of a letter, which this author has printed at the end of his book. In this letter, mention is made of one Loudham, an Englishman, who had invented a new manner of amputation. According to this method, a piece of flesh and skin is preserved, on one side of the part which is to be cut off, and applied on the stump, after the separation of the limb; which abridges the time of the cure, and facilitates the application of a wooden leg. At first, the utility of this method was not much attended to. But eighteen years afterwards, that is to say, in 1696, Verduin, a famous surgeon of Amsterdam, after having put it in practice, wrote a Latin dissertation on this head, printed at Amsterdam the same year, which M. Manget has inserted in his Bibliotheque Chirurgique. The next year, an extract was made of it at Leipsic, as already observed. In 1702, Sabourin, a very able surgeon of Geneva, proposed it to the Royal Academy of Sciences, which suspended its judgment, till they had such proofs as experience might furnish them with.

The following is a description of Verduin's method.

Two compresses are applied, one under the ham, and the other on the course of the large vessels. The thigh is wrapped in a fine linen cloth, which is sustained by some turns of a roller. The whole part is encompassed with a strip of dressed leather, six inches broad, furnished with three straps with buckles, to secure it round the part. The tourniquet is placed in the usual manner. The part, above the place intended to be amputated, is surrounded with a leather strap. The leg, being held by the assistants, the left hand is clasped round the calf, below the second ligature. The point of a crooked knife, which is made to pass as near as possible to the bones, is thrust in on one side, so as to come out on the other. The knife is made to descend pretty near to the tendo achillis, and thus separates almost the whole calf of the leg, to which it is held only by the upper part, and which is raised towards the thigh; after which the operation is finished in the ordinary manner. The wound is then washed with a wet sponge, to clear it of the fragments of the sawn bone. The leather strap, which served to secure the flesh, is loosened; the calf of the leg is clapped on the stump; it is a little compressed, by pushing it from the hinder towards the fore part. In order to maintain it, the wound is dressed with lycoperdon, lint and tow. The whole stump is wrapped up in a bladder, which is sustained by slips of sticking plaister. On this bladder are applied a compress, and a concave plate, which are sustained and compressed by means of two straps crossing each other, and attached to the large leather strap which surrounds the thigh.

M. De Garengeot thought it necessary to make several alterations in this method. He says, that, to keep the flesh firm, any other strap may be made use of, besides a leather one; and that it ought to be placed on the tuberosity of the tibia. He prefers to Verduin's crooked knife, that of M. Petit with the double edge. He would have the semicircular incision made, before that by which the flap is separated. He prescribes the giving some strokes, with the point of the knife, on the extremity of the bone which is to be preserved, and to raise the flap with a slit compress, whilst the bone is sawn. He advises the cutting off the overplus of the flap applied on the stump, and to sustain it by some stitches; or rather to employ the dry suture, which, according to him, is much better.

In the year 1739, Ravaton, surgeon-major of the hospital of Landau; and afterwards M. Vermale, seriously reflecting on the ordinary method of amputating limbs, especially the thigh, each of them proposed to the French Academy a kind of amputation with the double incision, different from the method of Verduin and Sabourin. Instead of preserving only one flap, as these practised, they advise the forming of two flaps; that the bone should afterwards be sawn, a ligature made on the vessels, and the two flaps applied, in order to procure their speedy re-union, and prevent the exfoliation of the bone, and too copious a suppuration.

However, there is some difference in their method of forming these two flaps. Ravaton makes three deep incisions down to the bone; first, a circular one, with a crooked knife, within four fingers breadth of the bone intended to be sawn; he afterwards makes, with a knife somewhat larger, the two others perpendicularly on the first, beginning at the place where the limb is separated, the one at the fore part, and the other at the hinder; and taking care not to touch the principal vessels; he detaches, in fine, the two flaps from the bone.

Vermale makes only two incisions, to form the two flaps. His dimensions must be taken very exactly. When he has fixed the tourniquet, as it ought to be in all amputations, he surrounds the part with two red threads, at the distance of four fingers breadth from each other; one at the place where the bone is to be sawn; the other at the place where the incision of the flaps is finished. He afterwards directs, to the fore part of the limb, the point of a bistoury, seven inches long, which he thrusts down to the bone; he makes it turn round the circumference, that it may come out by the opposite part; then directing the edge of the knife alone the bone, he cuts down to the inferior thread, where he separates the first flap, which, by this incision, is made, as the author says, of a round or conic figure at the extremity. He makes, in fine, in the same manner, the second flap on the interior side of the part, in case he has begun by the exterior side, and *vice versâ.*

Ravaton and Vermale both finish their operation in the same manner. They raise the flaps, and sustain them, when thus raised, by means of the slit compress; they cut away the rest of the flesh, and separate the periosteum, as usual. They recommend the sawing of the bone with a saw, whose teeth must be fine. They make a ligature on the vessels; let the strings hang by that part of the wound, which has the greatest declivity, draw the flaps together, and secure them by languettes or cross-cloths (at the extremity of which there is spread a sticking plaister), and by an apparatus, which may be easily conceived.

Garengeot performed at Mantes, in presence of M. Quesnay, the flap amputation, according to the method of Verduin and Sabourin, on a mason, whose right leg and foot had been fractured. We know that they made no ligature on the vessels, and that their intention by this method was, that the flap, being applied on the stump, and sustained by a particular apparatus which they have described, should reunite itself to the stump, and thereby stop the hemorrhage.

The above mentioned patient, who was dangerously wounded in several other parts of his body, died on the third day after the operation; and though it cannot be absolutely said that this was owing to the hemorrhage, yet must it be allowed, that it had a considerable share in it.

As the multiplicity of machines described by Verduin, La Faye, &c. has no other end, but to contain the flap so near the orifice of the vessels, that they might be exactly compressed and closed up; Garengeot reflected that, to obtain a just degree of this compression was very difficult, as the most considerable vessels are situated between the two bones, and all the vessels in general, when they are cut, withdraw themselves, so that it seems almost impossible that the flap should compress vessels thus retracted, and closed round with two extremities of bone. It was his opinion, therefore, that a stop ought to be put to the hemorrhage, by means of the ligature, which is always the surest expedient; and he resolved to practise it on the first occasion that offered.

With this view, twelve years after the operation we have been speaking of, he performed the flap amputation of the arm, on a soldier of the king's regiment of infantry: but he preserved two flaps, according to the method communicated to the Academy by M. Ravaton. He made a ligature on the brachial artery, and left the thread in the inferior angle of the division. This patient got well without any exfoliations.

Garengeot made a third experiment of this operation on a soldier of the same regiment, dangerously wounded in the right foot by the bursting of a bomb, which fractured the interior part of the two bones of the leg, and several of the foot.

In this operation, he left only one single flap. Garengeot, however, was fearful the quick union might create some difficulty of withdrawing the ligatures, and he therefore took a means of hindering adhesion where they were situated; but, of this objectionable plan, we shall not speak. He rightly preferred dressing and bandaging the stump to the use of the compressing machines invented by Verduin and La Faye.

The third patient was cured on the twenty-seventh day of the operation, and could easily bend and stretch out the extremity which remained of the leg.

Garengeot learned from the observation of the preceding case, that it would be advantageous to make the ligature in such manner as to embrace no more, than the vessel, so that it might fall off the sooner, and the flap unite more quickly. (*M. de Garengeot, in Mémoires de l'Acad. de Chirurgie, Tom. 5, in 12mo.*)

### SUBJECT OF AMPUTATION WITH A FLAP CONCLUDED.

We have already spoken of the flap-operation having been done by White and Bromfield above the ankle. In the year 1765, Sylvester O'Halloran, an eminent surgeon, of Limerick in Ireland, published a revival of the flap-amputation, upon a plan entirely new. However, his fault consisted in not putting the flap in contact with the wound, till after inflammation had subsided, about the twelfth day.

Messrs. Alanson and Lucas conjectured that the cure might be rendered more safe, easy, and expeditious, by applying the flap, with a view of uniting it by the first intention.

The following case explains Mr. Alanson's flap-operation. The disease was in the left leg, the patient, therefore, lay on his right side, upon a table of convenient height, so as to turn the part to be first cut fully into view. The intended line, where the knife was to pass in forming the flap, had been previously marked out with ink. A longitudinal incision was made with a common scalpel, about the middle of the side of the leg; first on the outside, then on the inside, and across the tendo Achillis: hence, the intended flap was formed, first by incisions through the skin and adipose membrane, and then completed, by pushing a catling through the muscular parts in the upper incised point, and afterwards carrying it out below, in the direction of the line already mentioned. Thus the whole flap was completed. The flap was thick, containing the whole substance of the tendo Achillis. The usual double incision was made; the retractor applied to defend the soft parts; and the bone divided, as high as possible, with the saw.

The flap was placed in contact with the naked stump, and retained there, at first by three superficial stitches, between which adhesive plasters were used. Notwithstanding the patient caught an infectious fever, a few days afterwards, the stump healed in three weeks, except half an inch at the inner angle, where the principal vent had been. In another week, the wound was reduced to a spongy substance, about the size of a split-pea. This being touched with caustic healed in a few days. The man was soon able to use an artificial leg, with which he walked remarkably well. He went several voyages to sea, and did his business with great activity. He bore the pressure of the machine totally upon the end of the stump, and was not troubled with the least excoriation or soreness.

In the next instance, in which Mr. Alanson operated, he formed the flap by pushing a double-edged knife through the leg, and, passing it downwards and then outwards, in a line, first marked out for the direction of the knife. In this way, the flap was made more quickly. (*Alanson on Amputation.*)

The leg should be completely extended during the operation; and kept in that posture, till the wound is perfectly healed.

We shall next notice Mr. Hey's method. This gentleman is satisfied, that very near the ankle, is not the most proper place for this kind of amputation.

Some cases occurring, in which, from a scrophulous habit, the wound at the stump would not heal completely, nor remain healed, Mr. Hey determined to try, whether amputation in a more muscular part would not secure a complete healing, and give the patient an opportunity of resting his knee on the common wooden leg, or using a socket, as he might find most convenient. Mr. Hey now prefers this method, and has reduced it to certain measures.

It had been customary, at the Leeds Infirmary, to make the length of the flap equal to one-third of the circumference of the leg. This was determined by the eye of the operator, who usually pushed the catling through the leg, near the posterior part of the fibula. Mr. Hey, finding the flap was not always of the proper breadth, began to determine this by measure, and now operates as follows: to ascertain the place where the bones are to be sawn, together with the length and breadth of the flap, he draws upon the limb five lines, three circular, and two longitudinal ones. He first measures the length of the leg from the highest part of the tibia to the middle of the inferior protuberance of the fibula. At the mid-point, between the knee and ankle, he makes the first or highest circular mark upon the leg. Here the bones are to be sawn. Here Mr. Hey also measures the circumference of the leg, and thence determines the length and breadth of the flap, each of which is to be equal to one-third of the circumference. In measuring the circumference of the limb, Mr. Hey employs a piece of marked tape, or riband, and places one end of it on the front edge of the tibia. Supposing the circumference to be twelve inches, he makes a dot in the circular mark on each side of the leg, four inches from the anterior edge of the tibia. These dots must, of course, be four inches apart behind. From each of these dots Mr. Hey draws a straight line downwards, four inches in length, and parallel to the front edge of the tibia. These lines shew the direction, which the catling is to take in making the flap. At the termination of these lines, Mr. Hey makes a second mark round the limb, to shew the place where the flap is to end. Lastly, a third circular mark is to be made an inch below the upper one, first made, for the purpose of directing the circular cut through the integuments, in front of the limb. The catling, for making the flap, should be longer than those commonly employed in amputations. Mr. Hey uses one which is seven inches long in the blade, and blunt at the back, to avoid making any longitudinal wound of the arteries, which is very difficult to close with a ligature, and for the same reason, he pushes the catling through the leg a little below the place where such muscles are to be divided, as are not included in the flap. The limb being nearly horizontal, and the fibula upward, he pushes the catling through the leg, where the dot was made, and carries it downward along the longitudinal mark, till it approaches the lowest circular mark, a little below which the instrument is brought out. The flap being held back, Mr. Hey divides the integuments on the front of the limb along the course of the second circular mark. The muscles not included in the flap, are then divided a little below the place where the bones are to be sawn. No great quantity of these muscles can be saved, nor is it necessary, as the flap contains a sufficient portion of the gastrocnemius and soleus muscles to make a cushion for the end of the bones. After sawing the bones, Mr. Hey advises a little of the end of the tendon of the gastrocnemius to be cut off, as it is apt to project beyond the skin, when the flap is put down; and he recommends the large crural nerve, when found on the inner surface of the flap, to be dissected out, lest it should suffer compression.

As strips of adhesive plaster cause great pressure on the end of the stump, Mr. Hey prefers using sutures for keeping the flap applied. Small strips of court plaster are to be put between the ligatures. The sutures may be cut out on the eighth or ninth day, and the flap supported by plasters.

Mr. Charles Bell describes another sort of flap-amputation. The operation is not to be done so low, as there will not be a sufficiency of muscle to cover the end of the bones. An oblique cut is to be made with the large amputating knife, upward, through the skin of the back part of the leg. The assistant is to draw up the skin, and the knife is to be again applied to the upper margin of the wound, and carried obliquely upward till it reaches the bones. The knife, without being withdrawn, is next to be carried, in a circular direction, over the tibia and fascia, covering the tibialis anticus, until it meets the angle of the first incision on the outside of the limb. The surgeon is then to pierce the interosseous membrane, &c. The sawing being completed, and the arteries secured, the flap is to be laid down, and the integuments of the two sides of the wound will be found to meet. (See *Bell's Operative Surgery, Vol.* 1.)

The flap-amputation is certainly more painful than the common method, and, though it has had very able men for its patrons, it is questionable, whether it is productive of the smallest advantage. Nor is there any necessity for adopting this kind of operation, though you may choose to amputate near the ankle. Mr. Lucas however conceives, that the stump will not bear the pressure of a machine for walking, unless a flap be preserved. (*Med. Obs. and Inq. Vol.* 5.)

The flap-amputation of the thigh is now quite abandoned by all the best surgeons in this country, and no description of it seems necessary. Foreign surgeons, however, seem not to have entirely rejected this way of operation. We read in Desault's works, by Bichat, that the former was in the habit of adopting this kind of amputation; but, it is a justice due to the eminent M. Sabatier, to state his disapprobation of the practice. (*Médecine Opératoire, Tom.* 3, *p.* 257. *Edit.* 1.)

Before I close this part of the subject, it seems right, that I should notice an unfounded accusation made by M. Roux, one of the surgeons of La Charité at Paris, against the English surgeons, viz. that of being necessarily admirers of the flap-operation, because they are advocates for union by the first intention He states, that he also saw in the London hospitals a larger proportion of individuals, on whom flap-amputations had been performed, than would be met with in the hospitals of Paris.

(See *Parallele de la Chirurgie Angloise avec la Chirurgie Francoise*, p. 340.)

In refutation of this account, it is only necessary to mention, first, that the flap-operation is condemned as a general practice, and as inferior to the common method, by every lecturer in the metropolis, and in all the best publications on surgery, which have issued from the English press, during many years past. Secondly; that though I served my apprenticeship, at one of the principal hospitals in London, viz. St. Bartholomew's, and frequented it altogether more than thirteen years, I never saw the flap-amputation performed, nor was it to my knowledge ever once done during such period in that institution.

Chopart's mode of removing a portion of the foot, and La Faye's method of amputating at the shoulder joint, are the two principal flap-amputations, which in my opinion have great merit. An account of them will be found in this article.

Some criticisms on the flap-amputation, by the intelligent M. Louis, may be found in the *Mem. de l'Acad. de Chir. T. 5. Edit. in* 12*mo.*

### AMPUTATION OF THE ARM.

The structure of the arm is very analogous to that of the thigh; like the latter, it contains only one bone, round which the muscles are arranged. The interior muscles are attached to the os brachii, while the more superficial ones extend along the limb, without being at all adherent. The first consist of the brachialis internus, and the two short heads of the triceps; the second, of the biceps, and long head of the triceps. Hence, amputation is here to be done in the same way as in the thigh, unless when we are necessitated to amputate very high up, above the insertion of the deltoid muscle.

The patient being properly seated, the arm is to be raised from the side, and, if the disease will allow it, into a horizontal position. The surgeon is to stand on the outside of the limb, apply the tourniquet as high as possible, and to have the skin and muscles which he is about to divide, made tense by the hands of an assistant. The soft parts are next to be divided, as much of the limb being preserved as possible. The bone is to be sawn with the usual precautions, and the bleeding stopped in the usual way. The stump is then to be dressed, and the patient put to bed, with the wound a little elevated from the surface of the bedding.

If the disease should require the arm to be taken off at its upper part, there would be no room for the application of the tourniquet. A compress might then be put in the axilla, and compressed by any strong bystander. With a straight bistoury, the surgeon is now to make a transverse incision down to the bone, a little above the lower extremity of the deltoid muscle. Two other longitudinal incisions, made along the front and back edge of this muscle, would form a flap, which must be detached and reflected. Lastly, the rest of the soft parts of the limb are to be divided by a circular cut, made on a level with the base of the flap. (*Sabatier Médecine Opératoire, Tom.* 3, *p.* 242, 243. *Edit.* 1.)

With regard to placing a compress on the artery in the axilla, as advised by Sabatier, this is not so eligible, as making pressure on the artery, as it passes over the first rib, and of which method we shall speak when we treat of amputation at the shoulder.

### AMPUTATION OF THE FOREARM.

The wisest maxim, with respect to the place for making the incision, is to cut off as little of the limb as possible. The forearm is to be held by two assistants, one of whom is to take hold of the elbow, the other of the wrist. The tourniquet is to be applied to the lower part of the arm, and the assistant, holding the elbow, should draw up the integuments, so as to make them tense. The circular incision is then to be made down to the fascia; from this as much skin is to be detached, reflected, and saved, as is necessary for covering the ends of the bones, and the muscles are to be cut on a level with the reflected skin, at the same time directing the knife obliquely upward. As many of them are deeply situated between the two bones of the forearm, too much attention cannot be paid to dividing all of them, with a double-edged knife introduced between the radius and ulna.

The soft parts are to be protected from the saw by a linen retractor. It is generally recommended to saw the two bones together, for which purpose the forearm should be placed in the utmost state of pronation. In any other position, the ulna is situated almost directly under the radius.

The ulnar, radial, and two interosseous arteries, are those, which usually require a ligature.

The hand may be amputated at the wrist, whenever the disease does not extend too high, and a flap can be made of the integuments of the back of the hand. Richerand thinks such an operation preferable to amputation above the joint; (*Nosogr. Chirurg. t.* 4, *p.* 506, *edit.* 4.) but it appears to me to have few recommendations. Here, the preservation of a couple of inches of the limb is of little importance, and if the surgeon should happen to save too much, the whole of the disease will not be removed. The operation at the wrist would I think be more painful and tedious, than amputation a little higher up; and how many cases there are, in which it is difficult to pronounce, whether the articular surfaces are entirely free from disease, or not?

### AMPUTATION AT THE HIP-JOINT.

The very idea of this formidable operation, for a long while, checked the hand even of the most ready advocate for the use of the amputating knife, and every mind shuddered at so extensive a mutilation. Still, it could not be denied, that the chance of saving life occasionally depended upon a submission to the greatest temporary suffering, and that without the most cruel of sacrifices, the preservation of the patient was totally impossible. Dreadful as amputation at the hip appeared, both in respect to the magnitude of the part of the body to be removed, and the extent of the wound caused by such removal, the French Academy of Surgery conceived, that there might be circumstances, under which its performance would be necessary. In the year 1756, they therefore proposed the following question, as the grand prize subject: *In the case, in which amputation of the hip-joint should appear to be the only resource for saving the patient's life, to determine whether this operation ought to be practised, and what would be the best way of performing it?* No satisfactory memoirs having been presented, the same subject was proposed in 1759. The approbation of the academy was now conferred on a paper, in which the possibility of amputating at the hip-joint was established. The cases, demanding the operation, are also determined by Barbet, the author. If, for instance, a cannon ball, or any other violently contusing cause, should have carried off or crushed the thigh, so as only to leave a few parts to be cut to make the separation complete, we ought not to hesitate about doing it, A sphacelus, extending to the circumference of the joint, and destroying the greatest part of the surrounding flesh, might render the operation equally necessary and easy. (See *Sabatier, Tom.* 3, *p.* 271, *&c.*) Cases are also adduced where the surgeon completed the separation of the dead parts with a knife. However, this cannot be considered as amputation at the hip-joint. Dividing a few dead fibres was a thing of no importance, in regard to the likelihood of its creating any bad symptoms. The proceeding, in fact, seems to me to have no analogy at all to the bloody operation of taking the thigh bone out of the socket. It is quite a different thing, when the operator has to cut through parts, which bleed profusely, and which are endued with life and sensibility. Some of the greatest modern surgeons condemn the proceeding. The following are Mr. Pott's sentiments: "M. Bilguer, and M. Tissot, are the only people whom I have met with, or heard of, in the profession, who speak of an amputation in the joint of the hip, as an advisable thing, or as being preferable to the same operation in the thigh." After a quotation or two, he continues; "that amputation in the joint of the hip is not an impracticable operation (although it be a dreadful one) I very well know. I cannot say, that I have ever done it, but I have seen it done, and am now very sure I shall never do it, unless it be on a dead body. The parallel, which is drawn between this operation and that in the shoulder will not hold. In the latter it sometimes happens, that the caries is confined to the head of the os humeri, and that the scapula is perfectly sound and unaffected. In the case of a carious hip-joint, this never is the fact; the acetabulum ischii, and parts about, are always, more or less in the same state, or at least in a distempered one, and so indeed most frequently are the parts within the pelvis, a circumstance this of the greatest consequence; for the power of performing the operation beyond the seat of the disease, and, consequently, of totally removing all the distempered parts, is the very decisive circumstance in favour of amputation every where, but, in the hip, where (to say nothing of the horridness of the operation itself) the hemorrhage, from a multiplicity of vessels, some of which are of considerable size, and the immense discharge which a sore of such dimensions must furnish, the distempered state of the parts, which cannot by the operation be removed, will render it ineffectual, bold and bloody as it must be." (*Pott on Amputation.*)

Callisen can hardly fancy any circumstances, in which such an amputation could be undertaken with hopes of success. (*Syst. Chir. Hod. p.* 418, *Tom.* 2, *edit.* 1800.)

And Richerand thinks, that, unless the limb be nearly separated by the disease, or accident, a prudent surgeon should decline making the attempt. (*Nosogr. Chir. Tom.* 4, *p.* 519, *edit.* 4.)

This dreadful operation was performed in this country, some years ago, by Dr. Kerr, of Northampton. (See *Duncan's Med. Commentaries, Vol.* 6, *p.* 337.) M. Larrey informs us, that he has performed it three times; twice in Egypt, and once, while he was surgeon to the French army on the Rhine. One of his patients survived the operation a week, at the end of which he was carried off by the plague; and the others died, after being conveyed, in a very uneasy manner, during a precipitate march of the army. (See *Relation* *de l'Expédition de l'Armée d'Orient en Egypte, &c.)*

M. Larrey operates as follows: he begins with making an incision in the track of the inguinal artery in the bend of the groin, and, with the aid of a semicircular curved needle, he ties this vessel, as closely as possible to Poupart's ligament, in order that the ligature, which is placed above the origin of the circumflex arteries and the profunda, may obviate all inconvenience from the bleeding, which might otherwise happen from their numerous branches. This being done, a straight knife is plunged into the thigh at the inside of the lesser trochanter, and a flap is here made of the soft parts of the inner and upper portion of the limb. The thigh is now put into the state of abduction; the inner part of the orbicular ligament, made tense by this position, is divided, and the joint opened. The ligamentum teres is then to be cut, and the bone dislocated. The knife is next to be brought to the outside of the great trochanter, and an external flap formed of the soft parts, calculated to meet that which has been made at the inside of the limb. In proceeding through the operation, M. Larrey secures, as soon as they are divided, the obturator arteries, and several branches of the pudendal, gluteal, and ischiatic arteries. The two flaps are to be brought together, and kept in this position, with strips of adhesive plaster, and a woollen spica bandage. (See *Mem. de Chirurgie Militaire.*)

In the Russian campaign M. Larrey had two more opportunities of amputating at the hip-joint. In the first instance, he operated upon a Russian at Witterp, who lived to the thirty-fifth day, when the wound was nearly healed; but the patient died of fever and dysentery caused by the scarcity and bad quality of his food. The second operation was done on a Frenchman, after the battle of Mozaïks, who was seen perfectly cured at Witterp, three months afterwards, by M. Bachelet, principal surgeon of the hospital of that town. (See *Guthrie on Gunshot Wounds, p.* 126.)

In 1812, M. Baffos, surgeon in chief of the hospital for children at Paris, amputated at the hip nearly in the manner of M. Larrey, except that he only compressed the artery in the groin, and did not begin with tying it. The patient was a child, seven years old, and the case a diseased hip. The patient got well of the wound; but died of scrofula, three months afterwards. The cotyloid cavity was found full of fungous flesh, and the os innominatum carious. As the latter state always exists in the diseased hip-joint, the whole of the disease does not admit of removal by amputation, and consequently the attempt ought never to be made. (See *Joints, Diseases of.*)

I assisted staff surgeon Cole, when he performed this operation in Holland in 1814. As I conceive that the plan, which was adopted by him, is upon the whole the least objectionable, I shall describe it. The flow of blood through the femoral artery was stopped by compressing the vessel in the groin with the handle of a key covered with lint. The thigh was then amputated as high as possible, close below the trochanters. The femoral artery was immediately secured, and afterwards every other vessel, which required a ligature. An incision was then made directly on the acetabulum, and the head of the bone removed with the utmost facility and expedition. The patient lost much less blood, than in ordinary amputations, and the wounds admitted of being brought together with adhesive plaster in the best manner possible. I am sorry to add, that the patient lived only till the following day.

I am only acquainted with three cases, in which amputation at the hip-joint proved successful. The first operation was that done by Mr. Brownrigg, surgeon to the forces, on the 12th of December 1812. The upper part of the thigh bone had been broken by a gunshot near Merida in Spain, the 29th of December 1811. The man is now living at Spalding in Lincolnshire in perfect health.

The second successful operation was that performed by M. Larrey, as mentioned above.

The third was done by Mr. Guthrie in the Netherlands on a French prisoner of war, who completely recovered.

On the other hand, the examples, which have failed, are numerous, though undertaken by surgeons of reputation and ability. Mr. Guthrie, Dr. Emery, Mr. Brownrigg, Monsieur Larrey, Mr. Brodie, Messrs. Blick and Cole, staff surgeons, and many other military practitioners, have had opportunities of amputating at the hip without success.

In a dreadful case, where the patient had his arm lacerated, and the upper part of the thigh-bone so badly fractured by a grape-shot, that the lower end of the fracture projected through the integuments at the back of the limb, I was induced to attempt amputation at the hip. But, though the patient did not lose six ounces of blood, he died in the course of a quarter of an hour, apparently from the shock caused on the system by so severe an operation. This case was witnessed by my friend Dr. Grant, inspector general of hospitals, staff-surgeon Cole, and others.

Were the upper portion of the thigh bone the only part diseased, or were it and the adjacent part of the pelvis splintered by a gunshot injury, I should rather listen to the suggestion of Mr. Charles

White, of Manchester, and endeavour when possible to perform the excision of the diseased, or splintered parts, than have recourse to amputation at the hip, an operation, however, which, as we have seen, has the sanction of authority, and of partial success.

### AMPUTATION AT THE SHOULDER JOINT.

The first description of this is to be found in *Le Dran's Observations*. His father, it seems, undertook the operation, in a case of caries conjoined with exostosis, which affection reached from the middle to the neck of the humerus. He began with rendering himself master of the bleeding, by introducing a straight needle, armed with a strong ligature, doubled several times. This was passed from the front to the back part of the arm, as closely to the axilla and bone as possible. The ligature, including the vessels, the flesh surrounding them, and the skin covering them, was tightened over a compress. Then Le Dran, with a straight narrow knife made a transverse incision through the skin and deltoid muscle down to the joint, and through the ligament surrounding the head of the humerus. An assistant raised the arm, and dislocated the head of the bone from the cavity of the scapula. This allowed the knife to be passed with ease between the bone and the flesh. Le Dran then introduced the knife downward, keeping its edge continually somewhat inclined towards the bone. In this manner, he gradually cut through all the parts, as far as a little below the ligature. As there was a large flap, Le Dran made a second ligature with a curved needle, which ligature included a great deal of flesh, the redundant portion of which was cut off together with the first ligature, which had become useless. The cure was completed in about ten weeks. Le Dran (the son) does not state, that the operation was a new one, and it appears, from the *Récherches Critiques sur l'origine, &c. de la Chirurgie en France*, and from La Faye's notes on Dionis, that it had been previously practised by Morand the father.

Garengeot thought a curved needle, with sharp edges, would be better for making the first ligature, and that the wound need not be so large, if the incision were to begin two or three finger-breadths from the acromion, and made so as to form two flaps, the lower one of which would correspond to the axilla, and might be brought into contact with the other, after the second ligature was applied.

La Faye extended the improvements further. After placing the patient in a chair, and bringing the arm into a horizontal position, he made, with a common bistoury, a transverse incision into the deltoid muscle down to the bone, four finger-breadths below the acromion. Two other incisions, one in front, the other behind, descended perpendicularly to this first, and made a large flap of the figure of a trapezium, which was detached and turned up towards the top of the shoulder. The two heads of the biceps, the tendons of the supra-spinatus, infra-spinatus, teres minor and subscapularis, and the capsular ligament, were next divided. The head of the humerus could now be easily dislocated, when the assistant, who held the lower part of the limb, made the bone describe the motion of a lever upward. La Faye next carried his incisions downward, along the inner part of the arm, until he was able to feel the vessels, which he tied as near the axilla as possible. Then he completed the separation of the limb, one finger-breadth lower down. All remaining to be done, was to bring down the flap over the glenoid cavity, and dress the wound. (See *Nouvelle Méthode pour faire l'Opération de l'Amputation dans l'articulation du Bras avec l'Omoplate, par M. La Faye, in Mém. de l'Acad. de Chirurgie, Tom. 5, p.* 195, *Edit. in* 12*mo.*)

The advantages of this plan are obvious. As only one ligature is applied, the patient is saved a great deal of pain; the flap, which is connected with the acromion, is more easily applied and kept on the stump, than the one, which Garengeot recommended to be made, at the lower part of the axilla. Lastly, the discharge can readily find vent downward.

Mr. Samuel Sharp recommended the following plan. "The patient's arm being held horizontally, make an incision through the membrana adiposa, from the upper part of the shoulder across the pectoral muscle, down to the arm-pit, then turning the knife with its edge upwards, divide that muscle and part of the deltoid, all which may be done without danger of wounding the great vessels, which will become exposed by these openings. If they be not, cut still more of the deltoid muscle, and carry the arm backward. Then with a strong ligature, having tied the artery and vein, pursue the circular incision through the joint, and carefully divide the vessels at a considerable distance below the ligature; the other small vessels are to be stopped, as in other cases.

"In doing this operation, regard should be had to the saving as much skin as possible, and to the situation of the processus acromion, which, projecting considerably beyond the joint, an unwary operator would be apt to cut upon." (*Operations of Surgery.*)

Bromfield's plan consisted in first exposing the axillary vessels, by dividing the integuments in the axilla. These vessels he detached, and tied. Then having cut the capsular ligament with scissars, he finished the operation on Mr. Sharp's plan.

At length, P. H. Dahl, in 1760, published at Goettingen, a Latin dissertation on amputation at the shoulder, in which publication he proposes making one's self master of the blood, before the operation, by a tourniquet, the pad of which pressed on the subclavian artery under the clavicle. This enabled the operator to dispense with tying the vessels in the first instance. Camper had observed, that if we push the scapula backward, and press the axillary artery with the finger between the clavicle, coracoid process, and great pectoral muscle, the pulse at the wrist instantly stops.

Dahl's tourniquet was obviously constructed, in consequence of what Camper had observed, and it consists of a curved, elastic plate of steel, the length of which may be readily imagined. A pad is attached to the shortest end of this plate, and is made capable of projecting further by means of a screw. The instrument is applied by making it embrace the shoulder from behind forward, while the pad presses on the hollow under the clavicle, between the margins of the deltoid and pectoral muscles. The long extremity of the steel plate, which descends behind the shoulder, is to be fixed to the body by a sort of belt. The pad is then to be depressed, until the pulsation of the axillary artery is stopped.

Further experiments have proved, however, that this tourniquet may be dispensed with, and the flow of blood in the axillary artery commanded, by properly compressing this vessel with a pad, at the place where it emerges from between the scaleni muscles, above the middle part of the clavicle. Thus the artery becomes pressed between the pad and the first rib, across which it runs. This method, which is as simple as possible, is preferable to that, which requires a tourniquet that is so seldom at hand.

Some practitioners, forgetful of the horizontal posture in which the patient is usually placed after the operation, have feared, that, in La Faye's method, the lower flap may sometimes confine the discharge. In order to avoid this inconvenience, Desault recommended the formation of two flaps, one of which was anterior; the other, posterior. The axillary artery was compressed from above the clavicle, at its coming out from between the scaleni muscles, while the integuments and flesh of the upper and internal part of the arm were pushed away from the humerus. A knife was plunged between these and the other soft parts behind, to make the anterior flap. The arm being inclined backward and outward, the humeral artery was tied, the articulation opened, and the head of the bone dislocated. The knife was then carried downward and backward, to form the posterior flap. (See *Sabatier's Médecine Opératoire, T. 3. p. 393-399, edit. 2.*)

M. Larrey, who has had frequent opportunities of amputating at the shoulder-joint, has aimed at the same object, which Desault did, but he has been in the habit of beginning with the formation of the external flap, for the following reason: By proceeding in this way, the surgeon can tie the humeral artery more safely, because the ligature is applied after the operation is entirely finished, and consequently at a time, when there is nothing to be attended to, but the hemorrhage. Thus, the patient being placed on a stool, and well supported, the arm is to be raised from the side, and the axillary artery compressed from above the clavicle. The integuments and other soft parts of the upper and outer part of the arm are then to be pushed away from the humerus, and the external flap formed. It is now very easy to cut the tendons of the infra-spinatus, and teres minor, and open the outside of the joint. The limb is to be carried inward, and luxated backward. The tendons of the supra-spinatus and biceps are to be divided, and as soon as the head of the bone is out of the glenoid cavity, the knife is to be carried along the internal part of the head and neck of the humerus, with its edge close to the bone. An internal flap, equal to the external one, is to be formed, consisting of a portion of the deltoid, great pectoral, biceps, and coraco-brachialis, muscles, and including the brachial vessels and nerves. The artery is to be taken hold of with a pair of forceps and tied. Any other vessels, which require a ligature, are also to be now secured. M. Larrey puts some charpie betwixt the flaps, and brings them towards each other by the usual means. (*See Mem. de Chir. Militaire, &c.*) Of this method of putting charpie to prevent union by the first intention, I entertain the most unfavourable opinion.

When M. Larrey published, he had operated in this way on nineteen patients, thirteen of whom recovered.

After the battle of Waterloo, I adopted La Faye's plan, to which I still give the preference, with this difference, however, that I do not cut the brachial artery till I make the last stroke of the knife, which separates the limb, and, consequently, I do not tie the vessel, till the time, when I have nothing but the hemorrhage to occupy my attention. The circumflex arteries, however, I tie, as soon as the external flap is made. It was also in this manner, that my able colleague at Brussels, Staff Surgeon Collier, performed several operations.

Some of the modern French surgeons practise a method, in which the compression of the axillary artery, either above, or below the clavicle, they consider quite unnecessary. Richerand, for instance, follows nearly the same plan as was advised by La Faye; but, after making the deltoid flap, cutting the tendons, and dislocating the bone, he dissects down close to the inside of the humerus, so as to enable an intelligent assistant to put his thumb on the cut surface behind the artery, which with the aid of the four fingers, applied to the skin of the axilla, can then be grasped and compressed, so as to command the flow of blood through it. The operator, now fearless of hemorrhage, completes the incision of the internal, or inferior flap. (*Richerand, Nosographie Chirurgicale, T. 4, p. 509-511, edit. 4.*)

M. Dupuytren, the present surgeon in chief of the Hotel-Dieu, at Paris, amputates at the shoulder, in a manner, which seems principally commendable on account of its celerity. The arm being raised and held at a right angle with the trunk, M. Dupuytren stands at the inside of the limb, with one hand grasps and elevates the mass of the deltoid muscle, and plunges under it a two-edged knife, from before backward, on a level with the end of the acromion. Cutting in this way close to the head of the humerus, he continues the incision downward between this bone and the deltoid, and at length bringing out the knife completes the external, or superior flap. The rest of the operation does not essentially differ from Richerand's, except that M. Dupuytren takes hold of the lower flap itself, before dividing it, and compresses the artery, until he has cut through it and tied it.

M. Dupuytren's plan would be difficult on the left side, unless the surgeon were an ambidexter; but, in other respects, it cannot be found much fault with. This surgeon has also proposed making one flap in front, and the other behind, in order to prevent a lodgment of matter. Richerand justly observes, however, that frequently a good deal of the wound unites by the first intention, and that as the patient after the operation lies in the recumbent posture on an oblique plane, he cannot see what advantage one way of making the flaps has over another, in regard to affording a ready issue to the discharge. (*Op. cit. p.* 515.)

For the sake of celerity, of which the French are rightly admirers in all capital operations, another plan of amputating at the shoulder has been proposed by Champesme and Lysfranc. In front of the fleshy part of the shoulder, and the scapular end of the clavicle, there is a slight triangular depression. Into the middle of this a narrow double edged bistoury is introduced. The instrument enters the joint, the head of the humerus not being in contact with the surface of the glenoid cavity of the scapula, when the arm is left to its own weight, and allowed to hang down by the side of the body. The incision is then carried round to make the external flap; and the head of the bone, which becomes more and more distant from the scapula, is easily dislocated, the tendons of the supra and infra-spinatus muscles having been cut in the beginning of the operation. Lastly; the internal flap is made in the way practised by Dupuytren, Richerand, &c.

Speaking of this mode of operating, Richerand remarks: "en l'employant, on parvient à désarticuler l'humérus, et à séparer le bras en aussi peu de temps qu'en met un habile découpeur à détacher l'aile d'un perdrix." (*P.* 514.)

Amputation at the shoulder has been in some degree superseded by a preferable operation, even in cases in which it would formerly have been deemed quite indispensable, such as considerable gun-shot fractures of the head of the humerus; a caries of the substance of this part, &c. Boucher, in *Tom.* 2. *Mem. de l'Acad. de Chir.* shews, that considerable wounds, extending into the shoulder joint, were capable of being successfully treated, by extracting the pieces of bone, which had been separated by violence. Instances are also recorded, in which, when the head and neck of the humerus had been totally disunited from the body of that bone, a cure was accomplished by making such incisions as allowed the portions of bone, now become extraneous bodies, to be taken away. Mr. White, of Manchester, proceeded further, and ventured to make a deep incision at the upper part of the arm, to dislocate the head of the humerus, which he knew was carious, and, pushing it through the wound, took it off with a saw.

"Edmund Pollit, of Sterling, near Cockey-Moor, in this county, (Lancashire) aged fourteen, of a scrofulous habit of body, was admitted into the Manchester Infirmary, April 6, 1768. The account I received with him was, that he had been suddenly seized, about a fortnight before, with a violent inflammation in his left shoulder, which threatened a mortification, but at last terminated in a large abscess, which was opened with a lancet a few days before his admission. The orifice was situated near the axilla, upon the lower edge of the pectoralis major, and through it I could distinctly feel the head of the os humeri, totally divested of its bursal ligament. The matter, which was very offensive, and in great quantity, had made its way down to the middle of the humerus, and had likewise burst out at another orifice, just below the processus acromion, through which the head of the os humeri might easily be seen. The whole arm and hand were swelled to twice their natural size, and were entirely useless to him. He suffered much pain, and the absorption of the matter had brought on hectic symptoms, such as night sweats, diarrhœa, quick pulse, and loss of appetite, which had extremely emaciated him.

"In these very dangerous circumstances there seemed to be no resource but an operation. The common one in these cases, that of taking off the arm at the articulation, with the scapula, appeared dreadful, both in the first instance, and in its consequences. I therefore proposed the following operation, from which I expected many advantages, and performed it on the fourteenth of the same month. I began my incision at that orifice which was situated just below the processus acromion, and carried it down to the middle of the humerus, by which all the subjacent bone was brought into view. I then took hold of the patient's elbow, and easily forced the upper head of the humerus out of its socket, and brought it so entirely out of the wound, that I readily grasped the whole head in my left hand, and held it there till I had sawn it off, with a common amputation saw, having first applied a pasteboard card betwixt the bone and the skin. I had taken the precaution of placing an assistant, on whom I could depend, with a compress just above the clavicle, to stop the circulation in the artery, if I should have the misfortune to cut or lacerate it, but no accident of any kind happened, and the patient did not lose more than two ounces of blood, only a small artery which partly surrounds the joint being wounded, which was easily secured.

"He was remarkably easy after the operation, and rested well that night; the discharge diminished every day, the swelling gradually abated, his appetite returned, and all his hectic symptoms vanished. In about five or six weeks I perceived the part from which the bone had been taken, had acquired a considerable degree of firmness, and he was able to lift a pretty large weight in his hand. At the end of two months I found that a large piece of the whole substance of the bone that had been denuded by the matter, and afterwards exposed to the air, was now ready to separate from the sound, and with a pair of forceps I easily removed it. After this exfoliation the wound healed very fast, and on August 15, he was discharged perfectly cured. On comparing this arm with the other, it is not quite an inch shorter; he has the perfect use of it, and can not only elevate his arm to any height, but can likewise perform the rotatory motion as well as ever. The figure of the arm is no ways altered, and from the use he has of it, and its appearance to the eye and to the touch, I think I may safely say the head, neck, and part of the body of the os humeri are actually regenerated.

"I did not make use of any splints, machine, or bandage, during the cure, to confine the limb strictly in one certain situation, nor was his arm ever dressed in bed, but sitting in a chair, and as soon as he could bear it, standing up with his body leaning forwards, to give room for the application of the bandages, which were no more than what was just necessary to retain the dressings; and to this method I attribute the preservation of the motion of the joint, which could not have been so well effected any other way, as the joint would in all probability have remained stiff, and formed an anchylosis, if it had not been allowed to play about.

"Though from this operation I hoped for many advantages preferable to the amputation of the limb at the scapula, yet my most sanguine expectations fell greatly short of the success attending it. I did not flatter myself with the hopes of a moveable joint, or that the length of the limb would be so nearly preserved, where there was a loss of above four inches of the whole substance of the bone, without any other bone to support it, as in the leg and forearm, and where the dreadful condition of the arm, at the time of the operation, prevented me from making use of any machine to keep it extended*. But I suppose the weight of the arm was in this case in some measure sufficient to counterbalance the contractile power of the muscles, as his arm was only suspended by a common sling, and the patient not at all confined to his bed. I could not help being surprized to find so much strength and firmness, as evidently shewed a regeneration of the bone, before the lower part had exfoliated, or even before it had begun to loosen. The osseous matter could not proceed from the scapula, the glenoid cavity of that bone not being divested of its cartilage; could it then possibly escape from the end of the sound bone, before the morbid part had begun to separate from it? Or are there any vessels that could convey the bony matter, and deposit it in the place of what had been removed †.

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* After the extraction of three inches and ten lines of the os humeri, M. Le Cat made use of a machine to keep the upper and lower pieces of the bone at their proper distances. He has given a description of the case, and a figure of the machine in vol. 56 of the Philos. Trans. p. 270.

† Mr. Gooch in his volume of cases and practical remarks, relating the case of a compound fracture of the leg, where a very

“These are points that I will not pretend to decide absolutely, but I am much inclined to the latter opinion. Is it not probable that there was a regeneration of the cartilage as well as of the bone? It is well known to every body conversant in anatomy, that not only the ends of some bones, which are joined to no others, are covered with cartilages, but that they are never wanting on the ends, and in the jointed cavities of such bones as are designed for motion, and I cannot see in this case how the motion could be preserved so complete without a cartilage; and indeed without a bursal ligament, or something analogous to it, to contain the synovia, and keep the bone in its place.

“As this is the first operation of the kind that has been performed, or at least made public, I thought the relation of it might possibly conduce to the improvement of the art. That ingenious surgeon, Mr. Gooch, has indeed related three instances of the heads of bones being sawn off in compound luxations. In one of these cases the lower heads of the tibia and fibula were sawn off, and in another that of the radius, and in the third that of the second bone of the thumb, but these were in many respects different from the present case. I believe it will seldom happen that this operation will not be greatly preferable to the amputation of the arm at the scapula, as this last is generally performed for a caries of the upper head of the os humeri, and as the preservation of a limb is always of the utmost consequence, and what every surgeon of the least humanity would at all times wish for, but particularly where, as in this case, the whole limb, and its actions, are preserved entire, the cure no ways protracted, and the danger of the operation most undoubtedly less. For though amputation is often indispensably necessary, and frequently attended with little danger or inconvenience when only part of a limb is removed, yet where the whole is lost, the danger is greatly increased, and the loss irreparable.

“I had frequently performed this operation upon dead subjects, and where the parts had not been diseased, and never found any difficulty; and from a dissection of the parts had no reason to doubt of success in a living subject, where the ligaments and muscles are more supple, and the matter, by insinuating itself betwixt the bone and integuments, has made less dissection necessary. I have likewise, in a dead subject, made an incision on the external side of the hip joint, and continued it down below the great trochanter, when, cutting through the bursal ligament, and bringing the knee inwards, the upper head of the os femoris hath been forced out of its socket, and easily sawn off; and I have no doubt but this operation might be performed upon a living subject with great prospect of success.

“The Royal Academy of Surgery at Paris, proposed for a prize question, whether amputation of the thigh, at its articulation with the os innominatum, was ever advisable; but, was I under a necessity of performing this operation, or that which I have been describing, I should not hesitate a moment which to prefer.

“I had the honour of shewing to the Royal Society the bones which were taken from the boy's arm, at the time this paper was read, and they are now deposited in their museum.” (*Cases in Surgery, with Remarks by Charles White, F. R. S. p.* 57.)

Bent, of Newcastle, has inserted a similar case in the 64th Vol. of the Philosophical Transactions. White made only one incision, from the vicinity of the acromion down to the middle of the arm. Bent, not being able to get at the head of the bone, through the wound, which he had made from the clavicle to the attachment of the pectoral muscle, detached a portion of the deltoid, where it is connected with the clavicle, and another part, where it is adherent to the humerus. Sabatier has proposed making two cuts at the upper part of the arm, which meet below like the letter V, extirpating the flap, dividing the inner head of the biceps, and capsular ligament; dislocating the head of the bone, and sawing it off. (*Médecine Opératoire. Tom.* 3.)

I think the cases, recorded by White and Bent, are truly important, inasmuch as they appear to have been the earliest models of a practice, which promises in a great measure to supersede all occasion for one of the most formidable and mutilating operations of surgery. To military and naval surgeons, these cases cannot

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considerable portion of the tibia was sawn off, says, “In about three weeks I was sensible, as were also several surgeons, whom curiosity led to see so uncommon a case, that the substance which grew in the space of five inches entirely void of bone, had acquired in the middle only a greater degree of solidity than flesh, which circumstance not agreeing with the generally received notion of the generation of callus, we proved, beyond dispute, with a sharp pointed instrument; and we observed that the ossification was gradually formed from that central point, which was considerably advanced before any exfoliation was cast off the ends of the divided bone. In less than four months the whole space was so well supplied with the callus, or rather new bone, that he was able to raise his leg, when the bandage was off, without its bending.” (*Cases and Remarks, new edit. p.* 287.)

fail to be highly interesting, as they must have frequent opportunities of availing themselves of the instruction, which they afford. M. Larrey, who was surgeon general to the French army in Egypt, employed the practice, with the greatest success, in cases of gunshot wounds. He thereby saved limbs, which, according to ordinary precepts and opinions, would have been a just ground for amputating at the shoulder; and, when we consider not only that a most dangerous operation is avoided, but that an upper extremity is saved, for which no substitute can be applied, we must allow, that the plan, first suggested and practised by Mr. White, cannot be too highly appreciated. When the arm is fractured near its upper extremity by a musket ball, it is considered by most surgeons necessary to amputate the limb, and, in such cases, the operation used invariably to be performed; but, says M. Larrey, "I have had the good fortune, on ten different occasions, to supersede the necessity for the operation, by the complete and immediate extraction of the head of the humerus, and of the splinters. I perform the operation in the following manner: I make an incision in the centre of the deltoid muscle, and parallel to its fibres, carrying the incision as low down as possible. I get the edges of the wound drawn asunder, in order to lay bare the articulation, of which the capsule is generally opened by the first incision, and by means of a probe pointed bistoury, I detach with the greatest ease from their insertions the tendons of the supra and infra spinati, of the teres minor, of the infra scapular, and of the long head of the biceps; then I disengage the head of the humerus, and remove it through the wound in the deltoid by means of my fingers, or of an elevator. I bring the humerus up to the shoulder, and fix it in a proper position with the aid of a sling and a bandage. Such is the operation which I performed on ten patients, in extirpating the head of the humerus; one of these died of the hospital fever, two of the scurvy, at Alexandria, and the fourth, after he was cured, died of the plague on our return to Syria. The rest returned to France in good health. The arm became anchylosed to the shoulder in some, and an artificial joint allowing of motion was formed in others." (See *Mém. de Chir. Militaire, T.* 2, *p.* 175.) Another successful case of the same kind has been more recently published by Mr. Morel, surgeon to the forces. (See *Medico-Chirurg. Trans. Vol.* 7, *p.* 161.)

### AMPUTATION OF THE HEADS OF BONES.

In a letter, dated 1782, and addressed to Mr. Pott, Mr. Park, surgeon of the Liverpool Hospital, made the proposal of totally extirpating many diseased joints, by which the limbs might be preserved, with such a share of the motions which nature originally allotted, as to be considerably more useful than any invention which art has hitherto been able to substitute.

Mr. Park's scheme, in short, was to entirely remove the extremities of all the bones, which form the joints, with the whole, or as much as possible, of the capsular ligament; and to obtain a cure by means of callus, or by uniting the femur and tibia, when the operation was done on the knee; and the humerus, radius, and ulna, when done on the elbow; so as to have no moveable articulation in those situations.

To determine whether the popliteal vessels could be avoided without much difficulty in the excision of the knee, Mr. Park made an experiment on the dead subject. An incision was made, beginning about two inches above the upper end of the patella, and extending about as far below its lower part. Another one was made across this at right angles, immediately above the patella down to the bone, and nearly half round the limb, the leg being in an extended state. The lower angles formed by these incisions were raised, so as to lay bare the capsular ligament; the patella was then taken out; the upper angles were raised, so as fairly to denude the head of the femur, and to allow a small catling to be passed across the posterior flat part of the bone, immediately above the condyles, care being taken to keep one of the flat sides of the point of the instrument quite close to the bone, all the way. The catling being withdrawn, an elastic spatula was introduced in its place, to guard the soft parts, while the femur was sawn. The head of the bone thus separated, was carefully dissected out; the head of the tibia was then with ease turned out, and sawn off, and as much as possible of the capsular ligament dissected away, leaving only the posterior part covering the vessels which on examination had been in very little danger of being wounded.

The next attempt was on the elbow, a simple longitudinal incision was made from about two inches above, to the same distance below, the point of the olecranon. The integuments having been raised, an attempt was made to divide the lateral ligaments, and dislocate the joint; but this being found difficult, the olecranon was sawn off, after which the joint could be easily dislocated, without any transverse incision, the lower extremity of the os humeri sawn off, and afterwards the heads of the radius and ulna. This appeared an easy work; but, Mr. Park conceives the case will be difficult in a diseased state of the parts, and that a crucial incision would be requisite, as well as dividing the humerus, above the condyles, in the way done with respect to the thigh bone.

Mr. Park first operated, July 2, 1781, on a strong, robust sailor, aged 33, who had a diseased knee, of ten years standing. The man's sufferings were daily increasing, and his health declining. Mr. Park, in the operation, wished to avoid making the transverse incision, thinking that after removing the patella, he could effect his object by the longitudinal one; but, it was found that the difference between a healthy and diseased state of parts, deceived him in this expectation. Hence the idea was relinquished, and the transverse incision made. The operation was finished exactly as the one on the dead subject related above. The quantity of bone removed was very little more than two inches of the femur, and rather more than one inch of the tibia. The only artery divided was one on the front of the knee, and it ceased to bleed before the operation was concluded, but the ends of the bones bled very freely. To keep the redundant integuments from falling inwards, and to keep the edges of the wounds in tolerable contact, a few sutures were used. The dressings were light and superficial, and the limb was put in a tin case, sufficiently long to receive the whole of it, from the ankle to the insertion of the gluteus muscle.

We shall not follow Mr. Park throughout the whole treatment. Suffice it to remark, that the case gave him a great deal of trouble, and that it was attended with many embarrassing circumstances, arising chiefly from the difficulty of keeping the limb in a fixed position, the great depth of the wound, and the abscesses and sinuses, which formed in the part. On the other hand, however, the first symptoms were not at all dangerous. But, the patient was obliged to keep his bed nine or ten weeks, and it was many months more before the cure was complete. The man afterwards went to sea, and did his duty very well, so useful was his limb to him.

Since the publication of the letter addressed to Mr. Pott, another excision of the knee has been done by Mr. Park. This operation was performed on the 22d of June, but the event was unsuccessful, as the patient lingered till the 13th of October, and then died.

About the same time that Mr. Park made his proposal, P. F. Moreau, a French surgeon, wrote in favour of a similar method. It only seems necessary to notice here the difference in Moreau's plan of operating from that adopted by our countryman. Moreau, the son, who has published the account, observes that the multiplicity of flaps is unnecessary, as two answer every purpose; and he deems Mr. Park's direction to remove the olecranon, if this be free from caries, at least useless. Moreau, junior, operated on the elbow as follows: he plunged a dissecting scalpel in upon the sharp edge, or spine of the inner condyle of the os humeri, about two inches above its tuberosity; and, directed by the spine, he carried the incision down to the joint. He did the same on the other side, and then laid the two wounds into one, by a tranverse incision, which divided the skin and the tendon of the triceps, immediately above the olecranon. The flap was dissected from the bone, and held up out of the way, by an assistant.

The flesh which adhered to the front of the bone, above the condyles, was now separated, care being taken to guide the point of the instrument with the fore-finger of the left hand, and, when the handle of the scalpel could be passed through between the flesh and the bone, M. Moreau allowed it to remain there, and sawed the bone through upon it. The removal of the piece of bone was next finished, by detaching it from all its adhesions. The removal of the heads of the radius and ulna, remaining to be done, was more difficult, and the first flap being insufficient, it became necessary to make another. The lateral incision, at the outer side of the arm, was extended downwards, along the external border of the upper part of the radius. The head of the radius was separated from the surrounding parts; its connexion with the ulna destroyed, and a strap of linen was introduced between the bones, to keep the flesh out of the way of the saw. The radius was sawn through, near the insertion of the biceps, which was fortunately preserved. Some remaining medullary cells, filled with pus, were removed with a gouge. The ulna was now exposed, by extending the lateral incision on the inner side of the arm. Thus another flap was made, and detached from the back part of the fore-arm, and that part of the bone which it was wished to remove. The bone, being separated from every thing that adhered to it, and a strap of linen put round it to protect the flesh, about an inch and a half of it was sawn off, measuring from the tip of the olecranon, downwards. A few diseased medullary cells were taken away with the gouge. Two or three vessels were tied, and the flaps were brought together with sutures. In a fortnight this man became so well, that he was allowed to go wherever he pleased, with his arm supported in a case. The arm was at first powerless, but it slowly regained its strength and the man could ultimately thrash corn and hold the plough with it, &c.

Seven months after another operation,

performed in the same way as the preceding one, by Moreau the father, the patient was completely cured, and two years after this period, the flexion of the fore-arm on the arm, was very distinct. In another case, only one longitudinal incision, and a transverse one, were made, the flap of course was triangular. The patient got well in six weeks, and in three months more joined his regiment.

In all Moreau's cases, the flexion and extension of the fore-arm were preserved, which circumstance no doubt depended very much on the insertion of the biceps not being destroyed. After the excision of the knee, however, the bones grew together.

Moreau, junior's, method of operating differed from his father's, in having the patient in a recumbent, instead of a sitting, posture, and in sawing the os humeri before it was dislocated.

In a knee case, Moreau the father operated as follows:—He made a longitudinal incision on each side of the thigh, between the vasti and the flexors of the leg, down to the bone. These incisions began about two inches above the condyles of the femur, and were carried down along the sides of the joint, till they reached the tibia. They were united by a transverse cut, which passed below the patella, down to the bone.

The flap was raised; the patella was attached to it, but being diseased was dissected out. The limb was then bent to bring the condyles of the femur into view. As it was desired to cut them from the body of the bone, before dislocating them, every thing adhering to them behind, where they joined the body of the bone, was separated, and, at that place the fore-finger of the left hand was passed through, in order to press back the flesh from the bone, and on that the saw was used. The knee having been bent, Moreau drew the cut piece towards him, and easily detached it from the flesh and ligaments.

The head of the tibia was laid bare by an incision, nearly eighteen lines long, made on the spine of that bone. The first lateral incision on the outer side of the knee, was extended nearly as far down on the head of the fibula. Thus were obtained one flap, which adhered to the flesh filling up the interosseous space, and another triangular flap, formed of the skin, covering the inner surface of the tibia, which bone was of necessity exposed, before the saw could be applied.

Upon raising the outer flap, the head of the fibula came into view, and, after being separated from its attachments, was cut off with a small saw. The inner flap was then raised, and the tibia, having been separated from the muscles behind, its head was sawn off.

It does not appear necessary to insert in this work the account of cutting out the ankle joint; an operation which will never be extensively adopted; nor shall I add any thing more concerning the mode of removing, in a similar way, the shoulder joint. In treating of amputation in this situation, I have already said enough, and whoever wishes for further information, respecting this practice, must refer to Dr. Jeffray's Work, entitled "*Cases of the Excision of Carious Joints.*" This publication contains all that is known on the subject. Dr. Jeffray has recommended a particular, and, indeed, a very ingenious, saw, for facilitating the above operation. The saw alluded to is constructed with joints, like the chain of a watch, so as to allow itself to be drawn through behind a bone, by a crooked needle, like a thread, and to cut the bone from behind forward, without injuring the soft parts. An instrument of this kind was executed in London, by Mr. Richards, who was assisted in making it by his nephew, the present Mr. Richards, of Brick-lane. In placing the saw under a bone, its cutting edge is to be turned away from the flesh. Handles are afterwards hooked on the instrument.

In my treatise on the diseases of the joints, which was honoured with the premium for 1806, by the College of Surgeons in London, I have made the following remarks on the excision of the large joints. "My sentiment has been already stated, with regard to the time, when every hope of curing a diseased joint ought to be abandoned. I have stated, that the approach of dissolution, in other words, the sunk state of the system can be the only solid reason for amputation, and that, as long as the patient's strength is not subdued by the irritation of the local disease, humanity dictates the propriety of persevering in an attempt to save the affected limb, &c. Will a patient, greatly reduced by hectic symptoms, be able to recover from so bold and bloody an operation, as the dissection of the whole of the knee-joint out of the limb? If some few should escape, with life and limb preserved, would the bulk of persons, treated in this manner, have the same good fortune? I cannot admit, that the extirpation of the whole of so large an articulation as the knee, can be compared with the operation of amputation, in point of simplicity and safety. However, it is not on the difficulty of practising the former, that I would found my objections; for, I believe, that any man possessing a tolerable knowledge of the anatomy of the leg, might contrive to achieve the business. The grounds on which I shall at present withhold my approbation from the attempt to cut out large joints, are the following:—1. The great length of time which the healing of the wound requires. Whover peruses the case of Hector M'Caghan, will find that the operation was performed on the 2d of July, 1781, and that it was February 28th of the following year, before all the subsequent abscesses and sores were perfectly healed. This space of time is very nearly eight months! Mr. Park describes the patient as a strong, robust sailor, and gives no further particulars concerning the state of his constitution, than that his health was declining. I entertain little doubt, that if the excision of the knee had been performed in that state of the health, in which amputation becomes truly indispensable, this man would not have survived the illness arising from the operation. The only other case, in which Mr. Park extirpated the knee, ended fatally. In the instance related by Moreau, there seemed, indeed, to be considerable debility. This patient escaped the first dangers consequent to so severe an operation; and, *after three months confinement*, the patient was in such a state, that *Moreau expected he would be able to walk upon crutches in another month or six weeks!* The young man in the mean time was attacked by an epidemic dysentery, and died. 2. Even supposing the excision of the knee to be followed with all possible success, is the advantage of having a mutilated, shortened, stiff limb, in lieu of a wooden leg, sufficiently great to induce any man to submit to an operation, beyond a doubt infinitely more dangerous than amputation? I think not." (See *the author's Treatise on the Diseases of the Joints, p.* 138.)

### AMPUTATION OF THE FINGERS AND TOES, AND PART OF THE FOOT.

Mr. Samuel Sharp observes, that the amputation of the fingers and toes is better performed in their articulation, than by any of the other methods. For this purpose a straight knife must be used, and the incision of the skin be made not exactly upon the joint, but a little towards the extremity of the finger, that more of it may be preserved for the easier healing afterwards. It will also facilitate the separation in the joint, when you cut the finger from the metacarpal bone, to make two small longitudinal incisions on each side of it first.

It may happen that the bones of the toes, and part only of the metatarsal bones, are carious, in which case the leg need not be cut off, but only so much of the foot as is disordered. A small spring saw is here better than a large one. When this operation is performed, the heel and remainder of the foot, will be of great service, and the wound heal up safely, as Mr. Sharp has once seen. (*Operations of Surgery.*)

In amputating the fingers and toes, the operation is greatly facilitated by cutting into the joint when it is bent. Having made an opening into the back part of the capsule, one of the lateral ligaments may easily be cut, after which nothing keeps the head of the bone from being turned out, and the surgeon has only to cut through the rest of the exposed ligamentous and tendinous parts.

Some recommend making a small semicircular flap of skin to cover the bone; but this is quite unnecessary, if care be taken to draw the skin a little up, and to cut where Mr. Sharp directs.

Mr. Hey describes a new mode of removing the metatarsal bones, which, on repeated trial has fully answered his expectations. Mr. Hey makes a mark across the upper part of the foot, to denote where the metatarsal bones are joined to those of the tarsus. About half an inch from this mark, nearer the toes, he makes a transverse incision, through the integuments and muscles covering the metatarsal bones. From each extremity of this cut, he makes an incision along the inner and outer side of the foot to the toes: he removes all the toes from the metatarsal bones, and then separates the integuments and muscles, forming the sole of the foot, from the inferior part of the metatarsal bones, keeping the edge of the knife as near the bones as possible, in order to expedite the operation, and preserve as much muscular flesh in the flap as can be saved. He then separates the four smaller metatarsal bones, at their junction with the tarsus, and divides, with a saw, the projecting part of the first cuneiform bone, which supports the great toe. The arteries being tied, Mr. Hey applies the flap, which had formed the sole of the foot to the integuments, which remain at the upper part, and keeps them in contact with sutures. The cicatrix being situated at the top of the foot, is in no danger of being hurt, while the place where the toes were situated, is covered with such strong skin, viz. what previously formed the sole of the foot, that it cannot be injured by any moderate violence. (See *Practical Observations in Surgery, p.* 535, *&c.*)

It is certainly often quite unnecessary to remove the whole foot, when the metatarsal bones are carious, and every other part of the leg is sound. The remainder of the foot is of immense service in walking, as the use of the ankle is not destroyed. Mr. Hey very judiciously recommends dissecting out the metatarsal bone of the great toe, when diseased, from the cuneiform bone, instead of sawing it. The latter plan cannot be easily accomplished, without removing part of the integuments and muscles, and making a transverse, as well as a longitudinal, incision. These disagreeable things may be avoided by following Mr. Hey's method.

The metatarsal bone of the little toe may be removed in a similar way.

It is very awkward to saw the metatarsal, and metacarpal bones, and, when the middle ones are to be divided, is indeed hardly practicable, without injuring the soft parts. I am, therefore, of opinion with Mr. C. Bell, that, instead of a formal amputation, it is better to extract the diseased bones from the foot, or hand, as, indeed, Mr. Hey is in the habit of doing.

M. Roux, in his late publication, finds fault with our ignorance of Chopart's method of removing a part of the foot. He says, "I am certain, the principal surgeons in England have never practised, and are even totally unacquainted with the amputation of the foot at the junction of the two halves of the tarsus, or Chopart's operation." (*Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 338.) As it is an operation of considerable merit, I think it will be useful to introduce a description of it in the present work. It is performed in the nearly parallel articulations of the calcaneum with the cuboides, and of the astragalus with the scaphoides. Thus the heel is preserved, on which the patient can afterwards walk. The performance of it is simple. The surgeon is to make a transverse incision through the skin, which covers the instep, two inches from the ankle-joint. He is to divide the skin, and the extensor tendons, and muscles, in that situation, so as to expose the convexity of the tarsus. He is next to make on each side a small longitudinal incision, which is to begin below and a little in front of the malleolus, and is to end at one of the extremities of the first incision. After having formed in this way a flap of integuments, he is to let it be drawn upward by the assistant who holds the leg. There is no occasion to dissect and reflect the flap; for the cellular substance connecting the skin with the subjacent aponeurosis is so loose, that it can easily be drawn up above the place, where the joint of the calcaneum with the cuboides, and of that between the astragalus and scaphoides, ought to be opened. The surgeon will penetrate the last the most easily, particularly in taking for his guidance, the eminence, which indicates the attachment of the tibialis anticus muscle to the inside of the os scaphoides. The joint of the cuboides and calcaneum lies pretty nearly in the same transverse line, but rather obliquely forward. The ligaments having been cut, the foot falls back. The bistoury is then to be put down, and the straight knife used, with which a flap of the soft parts is to be formed under the tarsus and metatarsus, long enough to admit of being applied to the naked bones so as to entirely cover them. It is to be maintained in this position with three or four strips of adhesive plaister, which are to extend from the heel, over the flap, to the inferior and anterior part of the leg. Some lint, compresses, and a bandage, compose the rest of the dressings.

Chopart used to tie every artery as soon as it was divided. On the instep, the continuation of the anterior tibial artery will require a ligature; and, in the sole, the internal and external plantar arteries, which will be found in the thickness of flap of the soft parts. One half of each ligature is to be cut away, and the other one is to be left hanging out between the plaisters, at the nearest and most convenient point.

Richerand conceives it would be an improvement, if only the lower flap were formed and employed for covering the stump; for, thus the line of the cicatrix would not be at the end of the stump, where it is most exposed to injuries. Sometimes, the diseased ulcerated state of the integuments forbids the making of an upper flap; and, when it can be made, the attempt is apt to make the surgeon lose sight of the precise line in which the articulation is to be opened; a thing, which should be accomplished at once, without any delay. (See *Richerand's Nosographie Chirurgicale, T.* 4, *p.* 502, 505, *edit.* 4.)

After the perusal of the foregoing account of the subject of amputation, I think a surgeon will derive many useful hints from the valuable observations of M. Louis. Although his mode of operating is not now imitated, and several of the things, which he recommends, are not at present attended to, I am of opinion, that the practitioner, who is acquainted with his remarks on this operation, will have a decided superiority over another surgeon that is entirely ignorant of them. Many of the observations are incontrovertible; the principles, inculcated, are generally founded on the most correct anatomical considerations; and, in the present indiscriminate fashion of dissecting up the skin, often quite unnecessarily, and always to the severe suffering of the patient, I am convinced, that M. Louis's sentiments may be studied with advantage. It is not to be inferred, however, that I suppose the double incision a bad mode of operating; but, only that I think it the duty of every surgeon to know where the dissection and preservation of skin are necessary, and where not.

The following sources of instruction, on the subject of amputation, are particularly entitled to notice: *Celsus de Re Medicâ. Œuvres de Paré, livre* 12, *chap.* 30 *and* 33. *Sharp's Operations of Surgery, chap.* 37. *Sharp's*

*Critical Enquiry into the present State of Surgery, chap.* 8. *Ravaton's Traité des Plaies d'Armes à Feu. Bertrandi's Traité des Opérations de Chirurgie, chap.* 23. *Le Dran's Traité des Opérations de Chirurgie. Heister's Instit. Chirurg. Pars* 2. *Sect.* 1. *Young's Currus Triumphalis e Terebinthinâ, Londini* 1679. *Nouvelle Méthode pour faire l'opération de l'Amputation dans l'Articulation du Bras avec l'Omoplate par M. De la Faye. Histoire de l'Amputation, suivant la Methode de Verduin et Sabourin, avec la Description d'un nouvel instrument pour cette Opération, par M. De la Faye. Moyens de rendre plus simple et plus sûre l'Amputation à Lambeau, par M. de Garengeot. Observation sur la Resection de l'Os; aprés l'Amputation de la Cuisse, by M. Veyret. Mémoire sur la Saillie de l'Os après l'Amputation des Membres; ou l'on examine les causes de cet inconvénient, les moyens d'y remédier, et ceux de la prevenir, par M. Louis. Second Mémoire sur l'Amputation des Grandes Extrémites, par M. Louis. The foregoing Essays are in Mém. de l'Acad. de Chirurgie, Tom.* 5, *Edit.* 12*mo. Essai sur les Amputations dans les Articles, par M. Brasdor, in Tom.* 15. *of the same work. Bilguer on the Inutility of Amputation. White's Cases in Surgery. Bromfield's Chirurgical Observations and Cases, Vol.* 1. *chap.* 2. *O'Halloran's Treatise on Gangrene, &c. with a new method of Amputation. Alanson's Practical Observations on Amputation. Pott's Remarks on Amputation. Sabatier's Médecine Opératoire, Tom.* 3. *Hey's Practical Observations in Surgery, Edit.* 2. *Remarques et Observations sur l'Amputation des Membres, in Œuvres Chir. de Desault par Bichat, Tom.* 2. *Encyclopédie Méthodique, Partie Chirurgicale, Tom.* 1. *art. Amputation. Rees's Cyclopædia, art. Amputation. Vermischte Chirurgische Schriften, von J. L. Schmucker, Band.* 1. *John Bell's Principles of Surgery. Cases of the Excision of carious Joints, by Park and Moreau, published by Dr. Jeffray. Operative Surgery by C. Bell, Vol.* 1. *Richter's Anfangsgrunde der Wundarzneykunst, Band* 7. *Richerand's Nosographie Chirurgicale, Tom.* 4. *Edit.* 4. *B. Bell's Surgery, Vol.* 5. *Mémoire sur l'Amputation des Membres, in Pélletan's Clinique Chirurgicale, Tom.* 3. *Gooch's Chirurgical Works—various parts of the three volumes. Larrey's Relation Chirurgicale de l'Armée d'Orient en Egypte et Syrie, and Mem. de Chirurgie Militaire. Petit's Traité des Maladies Chirurgicales, &c. Guthrie on Gunshot Wounds. Callisen's Systema Chirurgiæ Hodiernæ, Pars Posterior, Edit.* 1800. *Roux, Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 336, *&c. Paris* 1815. *Lawrence on a New Method of tying Arteries, &c. Medico-Chir. Trans. Vol.* 6, *p.* 156, *&c. Some interesting matter may also be expected in the forthcoming Reports on the Gunshot Wounds in the Military Hospitals of Belgium, by Professor Thomson. Dictionnaire des Sciences Medicales, art. Amputation.*

**AMYLUM.** Starch. Powdered starch is sometimes used as an external application to erysipelas; but, chiefly, in glysters, when the neck of the bladder is affected with spasm. The following is the formula used at St. Bartholomew's Hospital. ℞ Mucilaginis Amyli, Aquæ distillatæ, sing. ℥ij Tinct. Opii guttas quadraginta: Misce.

**ANASARCA,** (from ανα, through, and σαρξ, flesh.) A dropsical disease, in which an aqueous fluid is extensively diffused in the general cellular texture of the body. When less extensive, the complaint is termed, *œdema*, which then becomes a surgical case, unless entirely dependant upon constitutional causes.

**ANASTOMOSIS,** (from ανα, through, and στομα, a mouth.) Anatomists and surgeons imply, by this term, the communications of the blood vessels with each other, or their running and opening into each other, by which the continuance of a free circulation of the blood is greatly insured, and the danger of mortification lessened. The immense importance of this part of our structure, in all cases in which the main artery, or vein, of a limb, is obliterated, is particularly conspicuous in aneurisms. (See *Aneurism.*)

The changes which take place in the arterial system of the limb, when the main artery is rendered impervious by the application of a ligature, are well described by Mr. Hodgson: "The blood, meeting with an obstacle to its progress through the accustomed channel, is thrown in greater quantity, and with greater force, into those branches, which arise above the seat of the obstruction. The ramifications of these branches, in consequence of the unusual influx of blood, undergo a remarkable dilatation; the more minute vessels also, by which they anastomose with corresponding ramifications, arising from branches given off below the obstruction, are from the same cause sufficiently enlarged to allow a free passage of the blood into the inferior trunks of the limb. At first, the circulation is in this manner carried on through a congeries of minute anastomosing arteries: in a short time, a few of these channels become more enlarged, than the rest: as these increase in size, the smaller vessels gradually collapse, and ultimately a few large communications constitute permanent channels, through which the blood is transmitted to the parts, that it is destined to supply. This is one mode by which a collateral circulation is established.

"But, in some situations, more direct and ostensible inosculations are provided; so that when one channel is obstructed, the blood passes at once through the other in a sufficient stream for the nourishment of the part, which it is destined to supply. Under these circumstances, no dilatation of the collateral branches is necessary: the circulation in such instances, may be said to be constantly carried on through inosculating trunks. These great communications principally exist in the extremities of the body, where the dilating impulse, which the blood receives from the heart, is of course diminished. Thus, the radial artery inosculates freely with the ulnar; the anterior with the posterior tibial; and the internal carotid with the vertebral arteries. Two modes therefore, exist, by which arteries communicate with each other—the anastomoses of minute ramifications, and the direct inosculations of trunks." (See *Hodgson on the Diseases of Arteries and Veins, p.* 234, 236.) Refer also to the article *Inosculation* in this Dictionary.

ANCHYLOPS, (from αγχι, near, and ωψ, the eye.) Same as Ægylops.

ANCHYLOSIS, (from αγκυλος, crooked.) This denotes an intimate union of two bones, which were naturally connected by a moveable kind of joint. All joints originally designed for motion, may become anchylosed, that is, the heads of the bones, forming them, may become so consolidated together, that no degree of motion whatever can take place. Bernard Conner (*De stupendo ossium coalitu*) describes an instance of a general anchylosis of all the bones of the human body. A still more curious fact is mentioned in the *Hist. of the Acad. of Sciences,* 1716, of a child 23 months old, affected with an universal anchylosis. In the advanced periods of life, anchylosis more readily occurs, than in the earlier parts of it. The author of the article *anchylosis* in the *Encyclopédie Méthodique,* mentions his having preserved a specimen, in which the femur is so anchylosed with the tibia and patella, that both the compact and spongy substances of these bones appear to be common to them all, without the least perceptible line of separation between them. In old subjects, the same kind of union is commonly observable between the vertebræ, and between these and the heads of the ribs.

The greater, or lesser degree of immobility, has caused anchylosis to be distinguished into the *true* and *false.* In the true anchylosis, the bones have grown together so completely, that not the smallest degree of motion can take place, and the case is positively incurable. The position, in which the joint has become thus inalterably anchylosed, makes a material difference in the inconvenience resulting from the occurrence. The false anchylosis is that, in which the bones have not completely grown together, so that their motion is only diminished, not destroyed. The true anchylosis is sometimes termed *complete;* the false, *incomplete.*

In young subjects in particular, anchylosis is seldom an original affection, but generally the consequence of some other disease. It very often occurs after fractures, in the vicinity of joints; after sprains and dislocations attended with a great deal of contusion; and after white swellings and abscesses in joints. Aneurisms, and swellings and abscesses on the outside of a joint, may also induce anchylosis. In short, every thing which keeps a joint long motionless may give rise to the affection, which is generally the more complete the longer such causes have operated.

When a bone is fractured near a joint, the limb is kept motionless by the apparatus, during the whole time requisite for uniting the bones. The subsequent inflammation also extends to the articulation, and attacks the ligaments and surrounding parts. Sometimes, these only become more thickened and rigid; on other occasions, the inflammation produces a mutual adhesion of the articular surfaces. Hence fractures so situated, are more serious, than when they occur at the middle part of a bone. But, it is to be noticed, that all fractures leave, after their cure, a certain degree of stiffness in the adjacent joints; but, this arises from the inactivity, in which the muscles and articular surfaces have been, and may generally be cured by gradually exercising, and increasing the motion of the limb.

The position of an anchylosed limb is a thing of great importance. When abscesses form near the joints of the fingers, and the tendons mortify, the fingers should be bent, that they may anchylose in that position, which renders the hand much more useful, than if the fingers were permanently extended. The knee, on the contrary, should always be kept as straight as possible, when there is danger of anchylosis. The same plan is to be pursued, when the head of the thigh bone is dislocated in consequence of a diseased hip. When the elbow cannot be prevented from becoming anchylosed, the joint should always be kept bent. No attempt should ever be made to *cure,* though every possible exertion should often be made to *prevent,* a true anchylosis. The attempt to prevent, however, is not always proper, for many diseases of joints may be said to terminate, when anchylosis occurs.

When the false, or incomplete anchylosis is apprehended, measures should be taken to avert it. The limb is to be moved as much as the state of the soft parts will allow. Boyer remarks, that this precaution, is much more necessary in affections of the ginglimoid articulations, than of the orbicular ones, on account of the tendency of the former to become anchylosed, by reason of the great extent of their surfaces, the number of their ligaments, and the naturally limited degree of their motion.

The exercise of the joint promotes the secretion of the synovia, and the grating first perceived in consequence of the deficiency of this fluid, soon ceases. A certain caution is necessary in moving the limb: too violent motion might create pain, swelling, and inflammation, and even caries of the heads of the bones. It is by proportioning it to the state of the limb, and increasing its extent daily, as the soft parts yield and grow supple, that good effects may be derived from it. (See *Boyer Mal. des Os. Tom.* 2.) The use of embrocations, and pumping cold water on the joint, every morning, have great power in removing the stiffness of a limb remaining after the cure of fractures, dislocations, &c.

Unreduced dislocations are not always followed by anchylosis. Nature often forms a new joint, especially in persons of the lower order, who are obliged to move their limbs a great deal, in order to obtain a livelihood. The surrounding cellular substance becomes condensed, so as to form, around the head of the luxated bone, a membrane serving the purpose of a capsular ligament. The muscles, at first impeded in their action, become so habituated to their new state, that they resume their functions. This is particularly the case with bones which move in every direction, and have round heads; but, in ginglimoid joints, the heads of the bones are only imperfectly dislocated, and the motion is greatly restrained by the extent of surface; while some of the numerous ligaments are only sprained, not ruptured. These causes promote the occurrence of anchylosis.

Anchylosis may follow contusions of the joints, and such shocks, as the articular surfaces experience in leaping, or falling on the feet, from great heights. This is more likely to happen, when the inflammatory symptoms, resulting from such violence, have not been properly counteracted by bleeding, and other general remedies. Sprains, which violently twist the joints, very often, on this account, cause an anchylosis, especially, when the inflammation has long hindered such joints from being at all moved.

When diseases of joints end in a complete anchylosis, the occurrence is to be looked upon as a very favourable one. In fact, it is as much a means of cure, as the formation of callus is for the union of broken bones. The disease of the vertebræ, described by Pott, is cured, as soon as the bones anchylose, nor can the patient be considered well, before this event has taken place. See on this subject *l'Encyclopédie Méthodique, Partie Chirurgicale, Tom.* 1, *art. Anchylose. Boyer sur les Mal. des Os. Tom.* 2, *and his Traité des Maladies Chirurgicales, T.* 4. *p.* 553. *Verduc Traité des Bandages, chap.* 35, *p.* 172. *Job a Meekren's Obs. C.* 64, *p.* 297. *Callisen's Systema Chir. Hodiernæ. T.* 2. *p.* 699. *edit.* 1800. *Richerand's Nosographie Chirurgicale, Tom.* 3, *p.* 223, *edit.* 4.

**ANEURISM**, or **Aneurysm**, (from *ανευϱυνω*, to dilate.) The tumours which are formed by a preternatural dilatation of a part of an artery, as well as those swellings, which are occasioned by a collection of arterial blood, effused in the cellular membrane, in consequence of the rupture, or opening of the coats of the artery, receive the name of aneurisms. According to the common opinion, then, aneurisms are of two kinds; the first being termed *true;* the second, *spurious*, or *false.* Some writers admit a third species, which is said to happen, when, in consequence of the external coats of the artery having been divided, the internal tunics are protruded much in the same manner as the peritoneum is by the intestines, or omentum, in cases of hernia. This imaginary case has been denominated the *mixed* aneurism. *Aneurisma herniam arteriæ sistens.* It was no less celebrated a man, than Dr. William Hunter, who first supposed, that a disease, like the last, might proceed from the outer coats of an artery being cut, and the inner ones becoming consequently dilated. But, the experiments of Hunter and Home, as I shall have occasion to mention again, fully prove, that an aneurism will not arise from the kind of weakness, which cutting, or even stripping off, the external coat of an artery must produce.

It deserves attention, however, that, by the term *mixed* aneurism, Dr. Alexander Monro implied the state of a true aneurism, when its cyst has burst, and the blood has become diffused in the adjacent cellular substance. This event is certainly a real one; but, Dr. Hunter's case may be deemed altogether suppositious. Besides these common divisions of aneurism, there are two other kinds, one named the *aneurismal varix*, or *venous aneurism;* the other called by Mr. John Bell, the *aneurism from anastomosis;* the particulars of both which cases will be offered in due time.

Aneurisms are said to be much more frequent in England, than in France. During my residence at Paris in the winter of 1815, M. Du Puytren, surgeon in chief of the Hotel Dieu, and in the most extensive practice, informed me, that he had not had for a long while an opportunity of operating for an aneurism. M. Roux conceives, that the comparative frequency of the disease in England depends upon the mode of life, and kind of labor, to which a large part of the population of England are subjected. He thinks that we have been placed in favourable circumstances for perfecting the treatment of aneurisms, and he acknowledges, that we have contributed more than his countrymen, both in the last and present century, to the improvement of this branch of surgery. (*Roux, Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, &c. p.* 249.) While Hunter claims the honor of having brought into vogue the plan of taking up the artery some way above the disease without opening the sac, a plan which has led to those bold attempts by which modern surgery seems at last to have reached its utmost limits in regard to operations for aneurisms, Monro is entitled to the merit of having given the first exact account of the more ancient operation, in which the sac is opened. (See *Edinb. Med. Essays.*)

Before the period of Galen, the diseases, now known by the name of aneurisms, do not appear to have been noticed. It was the doctrine of this physician, that such swellings were produced either by anastomosis, or by rupture, and he has described their symptoms, without informing us, however, of the characters by which each of these cases was distinguishable, one from the other. Paulus Ægineta endeavoured to give a more particular account of the diagnosis, and he has detailed different modes of operating, applicable to the various cases of the disease. The sentiment of these writers was adopted by all their successors down to Fernelius, who declared, that every aneurismal tumour was occasioned by a dilatation of the coats of the arteries. This opinion has been almost universally adopted by the moderns, and, until the late publication of Scarpa, few surgeons entertained a suspicion, that a doctrine, so positively taught in the schools, could possibly be erroneous. It is a point, however, which yet remains in controversy. Mr. Hodgson, who has eminently distinguished himself by a valuable "*Treatise on the Diseases of Arteries and Veins*," has endeavoured to prove, that in aneurisms, the coats of the artery are sometimes dilated.

Boyer, an eminent surgeon of the present day, at Paris, also contends that the simultaneous dilatation of all the coats of an artery is an incontestible truth, and he will not accede to the opinion of Professor Scarpa, upon this interesting point. (See *Boyer's Traité des Maladies Chirurgicales, T. 2, p.* 96.)

Nor does Richerand altogether reject the doctrine of a dilatation of all the arterial coats; though he asserts, that this is only the case, where the tumor is small and incipient. (*Nosographie Chirurgicale, Tom.* 4, *p.* 81, *edit.* 2.)

### DIFFERENT SPECIES OF ANEURISM; SYMPTOMS, &c.

Previously to offering a more particular account of the doctrine taught by Scarpa, respecting the formation of aneurism, as well as of the chief facts, which may be adduced against a part of such doctrine, it seems proper to make the reader acquainted with the various species of the disease, their ordinary symptoms, and a few other circumstances.

When any part of an artery is dilated, the swelling is commonly named a *true*, or *genuine aneurism*. In such cases, the artery either seems only enlarged at a small part of its track, and the tumour has a determinate border, or, the vessel is dilated, for a considerable length, in which circumstance, the swelling is oblong, and loses itself so gradually in the surrounding parts, that its margin cannot be exactly ascertained. The first case, which is the most common, is termed the *circumscribed true aneurism*; the last, the *diffused true aneurism*. When blood escapes from a wound, or rupture, of an artery, into the adjoining cellular substance, the swelling occasioned is denominated the *spurious*, or *false aneurism*. In this instance, the blood either collects in one mass, distends the cellular substance, and condenses it into a cyst, so as to form a distinctly circumscribed tumour; or it is injected into all the cavities of the surrounding cellular substance, and extends along the course of the great vessels, from one end of the limb to the other, thus producing an irregular, oblong swelling. The first case is named, the *circumscribed false aneurism*; the second, the *diffused false aneurism*. (*Richter's Anfangsgr. Band.* 1.)

The symptoms of the circumscribed true aneurism take place as follows: the first thing the patient perceives is an extraordinary throbbing in some particular situation, and, on paying a little more attention, he discovers there a small pulsating tumour, which entirely disappears when compressed, but returns again as soon as the pressure is removed. It is commonly unattended with pain, or change in the colour of the skin. When once the tumour has originated, it continually grows larger, and, at length, attains a very considerable size. In proportion as it becomes larger, its pulsation becomes weaker, and, indeed, it is almost quite lost, when the disease has acquired much magnitude. The diminution of the pulsation has been ascribed to the coats of the artery losing their dilatable and elastic quality, in proportion as they are distended and indurated, and, consequently, the aneurismal sac being no longer capable of an alternate diastole and systole from the action of the heart. The fact is also imputed to the lamellated coagulated blood, deposited on the inner surface of the sac, particularly, in large aneurisms, in which some of the blood is always interrupted in its motion. Immediately, such coagulated blood lodges in the sac, pressure can only produce a partial disappearance of the swelling. This deposition of lamellated coagulum in the aneurismal sac is a circumstance of considerable importance; for, it has been well explained by Mr. Hodgson, that it is the mode by which the spontaneous cure of the disease is in most instances effected. "One of the circumstances, which in the most early stage generally attend the formation of aneurism, (says this author) is the establishment of that process, which is the basis of its future cure. The blood, which enters the sac soon after its formation, generally leaves upon its internal surface a stratum of coagulum, and successive depositions of the fibrous part of the blood gradually diminish the cavity of the tumour. At length the sac becomes entirely filled with this substance, and the deposition of it generally continues in the artery, which supplies the disease, forming a firm plug of coagulum, which extends on both sides of the sac, to the next important ramifications that are given off from the artery. The circulation through the vessel is thus prevented, the blood is conveyed by collateral channels, and another process is instituted, whereby the bulk of the tumour is removed, &c." (See *Hodgson on the Diseases of Arteries, &c. p.* 114.) In proportion as the aneurismal sac grows larger, the communication of blood into the artery beyond the tumour is lessened. Hence, in this state, the pulse, below the swelling, becomes weak and small, and the limb frequently cold, and œdematous. On dissection, the lower continuation of the artery is found preternaturally small and contracted. The pressure of the tumour on the adjacent parts also produces a variety of symptoms, ulceration, caries, &c. Sometimes, (says Richter) an accidental contusion, or concussion, may detach a piece of coagulum from the inner surface of the cyst, and the circulation through the sac be obstructed by it. The coagulum may possibly be impelled quite into the artery below, so as to induce important changes. The danger of an aneurism arrives when it is on the point of bursting, by which occurrence the patient usually bleeds to death, and this sometimes in a few seconds. The fatal event may generally be foreseen, as the part about to give way becomes particularly tense, elevated, thin, soft, and of a dark purple colour. (*Richter's Anfangsgr. Band.* 1.)

A large axillary aneurism, which burst in St. Bartholomew's Hospital, a few years ago, did not burst by ulceration, but by the detachment of a small slough from a conical, discoloured part of the tumour. Since this case fell under my observation, I have had an opportunity of seeing the process, by which an inguinal aneurism burst: at a certain point, the tumour became more conical, thin, and inflamed, and here a slough, about an inch in width was formed. On the dead part becoming loose, a profuse bleeding began. We are then to conclude, that external aneurisms do not burst by ulceration, but, by the formation and detachment of a slough.

This statement entirely coincides with that subsequently made by several writers of eminence, especially, Boyer. (See *Traité des Maladies Chirurgicales, T.* 2, *p.* 98.) "When the sac points externally, (says an accurate observer) it rarely or never bursts by laceration, but the extreme distention causes the integuments and investing parts to slough, and upon the separation of the eschar, the blood issues from the tumour. A similar process takes place, when the disease extends into a cavity, which is lined by a mucous membrane, as the œsophagus, intestines, bladder, &c. In such cases, the cavity of the aneurism is generally exposed by the separation of a slough, which has formed upon its most distended part, and not by laceration. But, when the sac projects into a cavity lined by a serous membrane, as the pleura, the peritoneum, the pericardium, &c. sloughing of these membranes does not take place, but, the parietes of the tumour having become extremely thin in consequence of distention, at length burst by a crack, or fissure, through which the blood is discharged. (See *Hodgson on the Diseases of Arteries,* &c. *p.* 85.)

When the aneurism is of considerable size, the collateral arteries, which originate above the swelling, are manifestly enlarged. Boyer informs us, that, in dissecting the lower extremity of a patient, on whom Desault had operated eight months previously for a popliteal aneurism, he found in the substance of the great sciatic nerve an artery, whose diameter was equal to that of the radial at the wrist. This vessel had its origin from the ischiatic artery, and descended to the back part of the knee, where it anastomosed with the upper articular arteries. Boyer had also noticed in the same subject before the operation, that one of the branches of the upper internal articular artery was so much enlarged, that its pulsation could be plainly felt on the internal condyle of the thigh-bone. (*Op. cit. p.* 93.) It is such enlargement of the collateral arteries above the disease, which insures to the limb below the tumor an adequate supply of blood when the obstruction to its passage through the diseased artery becomes considerable, or when this vessel has been rendered totally impervious by a surgical operation performed for the cure of the complaint.

In the very advanced stage of an aneurism, the skin is found extremely thin, and confounded as it were with the aneurismal sac. The cavities of the cellular substance near the disease are either filled with serum, or totally obliterated by adhesion. The adjacent muscles, whether they lie over the aneurism, or to one side of it, are stretched, displaced, dwindled, and sometimes confounded with other parts. It is the same with the large nervous cords situated at the circumference of the tumor: they are pushed out of their natural situation, diminished in size, sometimes adherent to the outside of the sac, and so changed as not to admit of being known again. Lastly, the cartilages and the bones themselves are not exempt from the mischief, which the aneurismal swelling produces in all the surrounding parts. They are gradually destroyed, and at length not the least trace of their substance remains, just in the same way as the bones of the cranium are destroyed by fungous tumors of the dura mater. (See *Dura Mater.*) The cartilages of the larynx, and rings of the trachea, are sometimes destroyed. This tube may be pierced, and the blood escape into it, or the aneurism may burst into the œsophagus. (*Boyer, Traité des Maladies Chirurgicales, T.* 2, *t.* 99.)

While an aneurism is small and recent, it does not in general cause pain, nor impede the functions of the limb. But, when it has increased, several complications are produced. Thus, the dragging of the saphenal nerve, by femoral aneurisms, frequently occasions acute pain in the course of this nerve as far as the great toe. The distention of the sciatic nerve by the popliteal aneurism, sometimes brings on intolerable pain, which extends to all the parts to which this nerve is distributed, and which can hardly ever be appeased by the topical use of opiate applications. The compression of the veins and lymphatics gives rise to œdema, numbness, and coldness of the limb. And, finally, it is the long-continued pressure of the aneurism on the neighbouring bones, which is the cause of their destruction. (*Boyer, p.* 105, *T.* 2.)

The *false aneurism* is always owing to an aperture in the artery, from which the blood gushes into the cellular substance. The case may arise from an artery being lacerated in violent exertions; but, the most common occasional cause is a wound. This is particularly apt to occur at the bend of the arm, where the artery is exposed to be injured in attempting to bleed. (For this case, see *Hemorrhage.*) In this circumstance, as soon as the puncture has been made, the blood gushes out with unusual force, and in a bright scarlet, irregular, interrupted current. It flows out, however, in an even, and less rapid stream, when pressure is applied higher up than the wound. These last are the most decisive marks of the artery being opened; for blood often flows from a vein with great rapidity, and in a broken current, when the vessel is very turgid, and situated immediately over the artery, which imparts its motion to it. The surgeon endeavours precipitately to stop the hemorrhage by pressure, and he commonly occasions a *diffused false aneurism.* The external wound in the skin is closed, so that the blood cannot escape from it; but, hence, it insinuates itself into the cellular substance. The swelling, thus produced, is uneven, often knotty, and extends upward and downward along the track of the vessel. The skin is also usually of a dark purple colour. Its size increases, as long as the internal hemorrhage continues, and, if this should proceed above a certain pitch, mortification of the limb ensues.

The *circumscribed false aneurism* arises in the following manner. When proper pressure has been made in the first instance, so as to suppress the hemorrhage; but, the bandage has afterwards been removed too soon, or before the artery has healed, the blood passes through the unclosed wound, or that which it has burst open again, into the cellular substance. As this has now become agglutinated by the preceding pressure, the blood cannot diffuse itself into its cells, and, consequently, a mass of it collects in the vicinity of the aperture of the artery, and distends the cellular substance into a sac. Sometimes, though not often, this circumscribed false aneurism, originates immediately after the opening is made in the artery. This chiefly happens when the aperture in the vessel is exceedingly small, and, consequently, the hemorrhage takes place so slowly, that the blood, which is first effused, coagulates, and prevents the entrance of that which follows into the cavities of the cellular substance, and, of course, its diffusion. A membrane, aponeurosis, &c. may also lie just over the orifice, so as to prevent the aneurism from being diffused.

The circumscribed false aneurism consists of a sac, composed of cellular substance, filled with blood, and situated close to the artery, with which it has a communication. Hence, in false aneurisms, a throbbing is always perceptible, and is more manifest, the smaller such tumours are. The larger the sac becomes, the less elastic it is, and the greater is the quantity of coagulated blood in it; so that in very large aneurisms of this kind, the pulsation is sometimes wholly lost.

The tumour is at first small, and on compression entirely disappears; but, returns as soon as this is removed. It also diminishes, when the artery above it is compressed; but, resumes its wonted magnitude, immediately such pressure is discontinued. When there is coagulated blood in the sac, pressure is no longer capable of producing a total disappearance of the tumour, which is now hard. The swelling is not painful, and the integuments are not changed in colour. It continually increases in size, and, at length, attains a prodigious magnitude.

The following are generally enumerated, as the discriminating differences between circumscribed true and false aneurisms: the true aneurism readily yields to pressure, and as readily recurs on its removal; the false one yields very gradually, and returns in the same way, as the blood in the sac can only pass and repass slowly through the aperture in the artery. Frequently, a hissing sound is very audible, when the blood gushes into the sac. The pulsation of the false aneurism is always more feeble, and, as the tumour enlarges, is sooner lost, than that of the true one, which even throbs after it has acquired a very considerable volume. The sac of the true aneurism is the artery itself; that of the false one is cellular substance. (See *Richter's Anfangsgr. Band.* 1.)

### DOCTRINE OF THE FORMATION OF ANEURISMS.

If the doctrines, however, of Professor Scarpa, of Pavia, which were published in 1804, are correct, the grand distinction of aneurism into *true* and *false* must be rejected, as erroneous: " for," says he, " after a very considerable number of investigations, instituted on the bodies of those, who have died of internal, or external aneurisms, I have ascertained, in the most certain and unequivocal manner, that there is only one kind, or form of this disease; viz. that caused by a solution of continuity, or rupture of the proper coats of the artery, with effusion of blood into the surrounding cellular substance; which solution of continuity is occasioned sometimes by a wound, a steatomatous, earthy degeneration, a corroding ulcer, a rupture of the proper coats of the artery, I mean the internal and muscular, without the concurrence of a preternatural dilatation of these coats being essential to the formation of this disease; and, therefore, that every aneurism, whether it be internal, or external, circumscribed, or diffused, is always formed by effusion." (*Treatise on Aneurism, by A. Scarpa. Transl. by Wishart. Preface.*) If this opinion be true, the difference in the symptoms of aneurisms above related, is to be imputed to the difference in the degree of rupture, diffusion, &c.

Scarpa observes, that it is an error to suppose, that the aneurism at the curvature, or in the trunk, of the aorta, produced by a violent and sudden exertion of the whole body, or of the heart in particular, and preceded by a congenital relaxation of a certain portion of this artery, or a morbid weakness of its coats, ought always to be considered, as a tumour formed by the distention, or dilatation of the proper coats of the artery itself, that is, of its internal and fibrous coats. Scarpa considers it quite demonstrable, that such aneurisms are produced by a corrosion and rupture of these tunics, and, consequently, by the effusion of arterial blood under the cellular sheath, or other membrane, covering the vessel. If ever there be a certain degree of preceding dilatation, it is not essential to constitute the disease; for it is not a constant occurrence, most aneurisms are unpreceded by it, and, in those rare cases, in which the aneurism is preceded and accompanied by a certain degree of dilatation of the whole diameter of the curvature of the aorta, there is an evident difference between an artery simply enlarged in diameter, and the capsule, which forms the aneurismal sac.

Dissections, carefully conducted, will shew, that the aorta contributes nothing to the formation of the aneurismal sac, and that this is merely the cellular membrane, which, in the sound state, covered the artery, or that soft cellular sheath, which the artery received in common with the neighbouring parts. This is raised by the blood into the form of a tumour, and is covered, in common with the artery, by a smooth membrane.

The Italian professor does not deny, that, from congenital relaxation, the proper coats of the aorta may not occasionally yield and become disposed to rupture; but he will not admit, that dilatation of this artery precedes and accompanies all its aneurisms, or that its proper coats ever yield so much to distention, as to form the aneurismal sac. The root of an aneurism of the aorta never includes the whole circumference of the artery; but, the aneurismal sac arises from one side in the form of an appendix, or tuberosity. On the contrary, the dilatation of the artery always occurs in its whole circumference, and, therefore, differs essentially from aneurism. Thus, there is really a remarkable difference between a dilated and an aneurismatic artery, although these two affections are sometimes found combined together, especially, at the origin of the aorta. If we also consider, that the dilatation of an artery may exist, without any organic affection, the blood being always in the cavity of the vessel; that in an artery so affected, there is never collected any grumous blood, or polypous layers; that the dilatation never forms a tumour of considerable bulk, and, that, while the continuity of the proper coats remains uninterrupted, the circulation of the blood is not at all, or not so sensibly changed, we shall be obliged to allow that aneurism differs essentially from the dilatation of an artery.

Galen, Œtius, Paulus, Actuarius, Haly, Albucasis, Oribasius, and Avicenna, who only treat of external aneurisms, speak of no other cases, than those by *effusion;* and, although some of these writers introduce the distinction, that external aneurisms are produced in three ways, viz. by *anastomosis*, by *diapædesis*, and by *diæresis*, they all affirm, that external aneurisms are invariably formed by the extravasation of blood under the skin. By *dilatation*, the Greek and Arabian physicians did not mean the expansion of the proper coats of the diseased artery; but, that tumour which the effused and coagulated arterial blood forms in the cellular membrane under the skin. Thus Œtius: *oritur dilatatio, aut dum sanguis, et spiritus ex arteriis prosultant; aut dum oscula ipsorum aperiuntur, aut dum rumpuntur. Sanguis autem et spiritus paullatim excreti sub cute colliguntur.* See also additional quotations in Scarpa from Actuarius, Silvaticus, &c.

Fernelius first published the theory of the dilatation of the coats of the arteries, as the proximate cause of aneurisms, particularly, internal ones, arising from no evident causes. The theory of Fernelius, however, instead of being deduced from observations on the dead subject, was only the result of his own imagination, and false conjectures, that effused arterial blood would immediately putrify, and could never form, out of the vessels, a pulsating tumour. Sennertus, Hildanus, Barbette, and several others, rejected this theory, and were all convinced, that both internal and external aneurisms were formed by the rupture, and not by the dilatation of the internal coats of the artery.

Scarpa endeavours to demonstrate, by accurate dissections of arteries both in the sound and morbid state, what share the proper and constituent coats of the artery have in the formation of the aneurismal sac, and what belongs to the cellular covering, and other adventitious membranes surrounding the artery.

The covering of an artery is merely an adventitious sheath, which the vessel receives in common with the parts in the vicinity of which it runs. On cutting an artery across in its natural situation, the segment of the cut vessel retires and conceals itself in this sheath.

This cellular covering is most evident round the curvature and trunk of the aorta, the carotid, mesenteric, and renal arteries; it is less dense round the trunk of the brachial, femoral, and popliteal arteries. The pleura lies over the cellular sheath of the arch of the aorta, and over that of the thoracic aorta; and that of the abdominal aorta is covered by the peritoneum. Both these smooth membranes adhere to, and surround, two-thirds of the circumference of the vessel. The great arteries of the extremities are not covered, in addition to the cellular substance, by any smooth membrane of this sort, but by a cellular sheath, which is demonstrably distinct from the adipose membrane, and serves to inclose the vessels, and connect them with the contiguous parts.

When air, or any other fluid, is injected by a small hole made artificially, between the cellular covering, and the subjacent muscular coat of the artery, the injected matter elevates into a tumour the cellular membrane, which closely embraces the artery, without properly destroying its cells, which it distends in a remarkable manner. When melted wax is injected, and pushed with much force, the cellular sheath of the artery is not only raised over the vessel, like a tumour, but, the internal cells of that covering are also lacerated, and, on examining afterwards the capsule of the artificial tumour, it appears as if it were formed of several layers, rough and irregular internally, smooth and polished externally. The same thing happens, when any injection is pushed with such force into an artery, as to rupture the internal and muscular coats at some point of their circumference. Nicholls performed this experiment several times before the Royal Society. (*Philos. Trans. an.* 1728.) As soon as the internal coat is ruptured, the muscular one also gives way; but, the external cellular sheath, being of an interlaced texture, and the thin laminæ, of which it is composed, being not simply applied to one another, but, reciprocally intermixed, is capable of supporting great distention, by yielding gradually to the impulse of the blood, without being torn, or ruptured.

This celebrated professor is of opinion, that the same phenomena may be observed, when the internal coat of the aorta becomes so diseased, as to be ruptured by the repeated jets of blood from the heart. In this circumstance, the blood, impelled by the heart, begins immediately to ooze through the connexions of the fibres of the muscular coat, and gradually to be effused into the interstices of the cellular covering, forming, for a certain extent, a kind of *ecchymosis*, or *extravasation of blood*, slightly elevated upon the artery. Afterwards, the points of contact, between the edges of the fibres of the muscular coat, being insensibly separated, the arterial blood, penetrating between them, fills and elevates, in a remarkable manner, the cellular covering of the artery, and raises it after the manner of an incipient tumour. Thus the fibres and layers of the muscular coat, being wasted, or lacerated, or simply separated from each other, the arterial blood is carried with great force, and in greater quantity, than before, into the cellular sheath of the artery, which it forces more outwards; and, finally, the divisions, between the interstices of the cellular coat, being ruptured, converts it into a sac, which is filled with polypous concretions, and fluid blood, and at last forms, strictly speaking, the aneurismal sac. The internal texture, although apparently composed of membranes placed one over the other, is, in fact, very different from that of the proper coats of the artery, notwithstanding the injured vessel and aneurismal sac are both covered externally, in the thorax and abdomen, with a smooth membrane.

Scarpa has examined a considerable number of aneurisms, of the arch, and of the thoracic, and abdominal trunk, of the aorta, without finding a single one, in which the rupture of the proper coats of the artery was not evident, and in which, consequently, the sac was produced by a substance completely different from the internal and muscular coats.

The aneurismal sac never comprehends the whole circumference of the vessel. At the place where the tumour joins the side of the tube, the aneurismal sac presents a kind of constriction, beyond which it becomes more or less expanded. This would never happen, or rather the contrary circumstance would occur, if the sac were formed by an equable distention of the tube and proper coats of the affected artery. In incipient aneurisms, at least, the greatest size of the tumour would then be in the artery itself, or root of the swelling, while its fundus would be the least. But, whether aneurisms be recent and small, or of long standing and large, the passage from the artery is always narrow, and the fundus of the swelling greater in proportion to its distance from the vessel. The sac is always covered by the same soft dilatable cellular substance, which united the artery in a sound state to the circumjacent parts. Such cellular substance, in aneurisms of the thoracic aorta, is covered by the pleura, and, in those of the abdominal aorta, by the peritoneum, which membranes include the sac and ruptured artery, presenting outwardly a continued smooth surface, just as if the artery itself were dilated. But, if the aorta be opened lengthwise on the side opposite the constriction, or neck of the tumour, the place of the ulceration, or rupture, of the proper coats of the artery, immediately appears within the vessel, on the side opposite to that of the incision. The edge of the fissure, which has taken place, is sometimes fringed, often callous, and hard, and through it it was, that the blood formed itself a passage into the cellular sheath, which is converted into the aneurismal sac. If, as sometimes happens, in the arch of the aorta near the heart, the artery, before being ruptured, has been somewhat dilated, it seems, at first, as if there were two aneurisms; but, the constriction, which the sac next to the artery, presents externally, points out exactly the limits, beyond which the internal and muscular coats of the aorta had not been able to resist the distention, and where of course they have been ruptured. The partition, which may always be seen dividing the tube of the artery from the aneurismal sac, and which is lacerated in its middle, consists of nothing else than the remains of the internal and muscular coats of the ruptured artery.

By carefully dissecting the proper coats of the ruptured aorta in its situation, and comparing them with the cellular substance forming the sac, the truth of the preceding statement may be indisputably demonstrated.

When an incision is made lengthwise in the side of the vessel opposite the rupture, its proper coats are found either perfectly sound, or a little weakened and studded with earthy points, but, still capable of being separated into distinct layers. On the contrary, in the opposite side of the aorta, where the rupture is, the proper coats are unusually thin, and are only separable from each other with difficulty, or even not at all; they are frequently brittle, like an egg-shell, and are disorganised and torn at the place where they form the partition between the ruptured artery and the mouth of the aneurismal sac. Continuing to separate these coats, from within outwards, we arrive at the cellular sheath surrounding the aorta. This sheath being much thickened in large aneurisms, and very adherent to the subjacent muscular coat of the artery at the place of the constriction of the sac, is very apt to be mistaken for a dilated portion of the vessel itself. But, even in such cases, we may at last separate it, without laceration, from the tube of the artery, above and below the injury, and, successively, from the muscular coat, as far as the neck of the aneurism. Then it is clear, the muscular coat does not pass beyond the partition, separating the cavity of the artery from that of the aneurismal sac, over which it is not prolonged, but terminates at the edge of the rupture like a fringe, or in obtuse points. Errors are more apt to occur, in consequence of the aorta and sac being both covered by the pleura, or peritoneum.

The portion of the aorta, within the pericardium, being only covered by a thin reflected layer of this membrane, such layer may also be lacerated, when the proper coats give way, and blood be effused into the cavity of the pericardium. Examples of this kind are related by Walter, Morgagni, &c. and Scarpa himself. In the latter instance, on making an incision into the concave part of the aorta, opposite the tumour which had formed under the layer of the pericardium, which had also burst by a small aperture, its internal coat, corresponding to the base of the swelling, was quite rough, interspersed with yellow hard spots, and actually ulcerated for the space of an inch in circumference. The preparation is preserved in the museum at Pavia.

But, all other parts of the aorta having, between them and the pleura and peritoneum, a cellular sheath of a stronger and more yielding nature, which allows itself to be distended into a sac, and being strengthened internally, by polypous layers, and, externally, by the pleura or peritoneum, oppose for a long while the fatal effusion of blood.

Scarpa believes that what he calls the slow, morbid, steatomatous, fungous, squamous, degeneration of the internal coat of the artery is more frequently the cause of its bursting, than violent exertions of the whole body, blows, or an increased impulse of the heart. This kind of diseased change is very common in the curvature, and thoracic and abdominal trunks, of the aorta. In the incipient state of such disease, the internal coat of the artery loses, for a certain space, its beautiful smoothness, and becomes irregular and wrinkled. It afterwards appears interspersed with yellow spots, which are converted into grains, or earthy scales, or into steatomatous, and cheese-like concretions, which render the internal coat of the artery brittle and so slightly united to the adjoining muscular coat, that, upon being merely scratched with the knife, or point of the nail, pieces are readily detached from it, and, on being cut, it gives a crackling sound, similar to the breaking of an egg-shell. This ossification cannot be said to be proper to old age, since it is sometimes met with in subjects not much advanced in life. The whole of the side of the artery, in that part which is occupied by the morbid affection, is, for the most part, hard and rigid, sometimes soft and fungous, and, in most cases, the canal of the artery is preternaturally constricted. In the highest degree of this morbid disorganization, true ulcerations are found on the inside of the artery, with hard and fringed edges, fissures, and lacerations of the internal and fibrous coats of the artery.

Whenever an aneurismal sac of an immoderate size beats violently, and, for a long while against a bone, as the sternum, ribs, clavicle, and vertebræ, the bones are in the end invariably corroded, so that the aneurismal sac elevates the integuments of the thorax, or back, and pulsates immediately under the skin. Scarpa, with the best modern writers, attributes the effect to absorption, in consequence of the pressure.

Having presented the reader with an abridged account of the most important remarks, made by Scarpa, in support of the doctrine he defends, we now annex his conclusions. 1. That this disease is invariably formed by the rupture of the proper coats of the artery. 2. That the aneurismal sac, is never formed by a dilatation of the proper coats of the artery, but, undoubtedly, by the cellular sheath, which the artery receives in common with the parts contiguous to it; over which cellular sheath the pleura is placed in the thorax, and the peritoneum in the abdomen. 3. That if the aorta, immediately above the heart, appears sometimes increased beyond its natural diameter, this is not common to all the rest of the artery, and when the aorta, in the vicinity of the heart yields to a dilatation greater than natural, this dilatation does not constitute, properly speaking, the essence of the aneurism. 4. That there are none of those marks regarded by medical men as characteristic of aneurism from *dilatation*, which may not be met with in aneurism from *rupture*, including even the circumscribed figure of the tumour. 5. That the distinction of aneurism into *true* and *spurious*, adopted in the schools, is only the production of a false theory; since observation shews, that there is only one form of this disease, or that caused by a rupture of the proper coats of the artery, and an effusion of arterial blood into the cellular sheath, which surrounds the ruptured artery. (See *Treatise on Aneurism, by A. Scarpa, translated by J. H. Wishart, Edinb.* 1808).

Such are the inferences of Scarpa, one of the most distinguished anatomists and surgeons of the present day upon the continent. It has been already stated, that great as this authority is, several eminent modern surgeons, as Richerand, Boyer, Sabatier, &c. have not altogether yielded to it, but still contend, that, in some aneurisms, the coats of the artery are dilated. These celebrated professors in France have coincided with what has been usually taught upon this subject in the surgical schools of Great Britain. Every lecturer here has been accustomed to describe the distinctions of aneurisms into true and false, or into cases which are accompanied with dilatation, and into others, which are attended with rupture of the arterial coats. Mr. Hodgson, a surgeon of considerable talent in London, has lately published an inestimable treatise on aneurisms, in which work he differs from Scarpa, and joins those surgical writers who believe in the occasional dilatation of the coats of the arteries in cases of aneurism. He enquires: "Is every aneurism produced by a destruction of the internal and middle coats of the vessel, and does not a partial dilatation of these coats occasionally precede, and give rise to their destruction? I believe that this is frequently the case. We have seen, that the disorganization of the coats of an artery by destroying their natural elasticity, will give rise to permanent dilatation of the whole circumference of the vessel; and there is every reason to expect, that a loss of its elasticity in a portion only of the diameter of the vessel will give rise to a partial dilatation of its coats. Indeed, the proofs of a partial dilatation of the coats of an artery, particularly of the aorta, are incontestably established by the possibility of tracing the coats of the vessel throughout the whole extent of the expansion, and by the existence of those morbid appearances in the sac, which are peculiar to the coats of the arteries.

"In the year 1811 (says Mr, Hodgson), I dissected an aneurism of the aorta, which was removed from the body of a young woman by my friend Dr. Farre. The sac was as large as a small melon, and had proved fatal by bursting into the posterior mediastinum, and subsequently into the cavity of the thorax. This aorta exhibited the formation of aneurism by partial dilatation in three distinct stages. The internal coat was throughout inflamed, and presented a fleshy and irregular appearance. At the arch of the aorta, there was a dilatation not larger, than the half of a small pea. About two inches lower in the same vessel, was a second dilatation, which would have contained a hazel nut, and immediately above the diaphragm was the large aneurism, which had proved fatal. I removed that portion of the vessel, which contained the smallest dilatation, and macerated it until its coats could be separated without violence. I found that the dilatation existed equally in the three coats of the vessel, and, when separated, each presented the appearance of a minute aneurism. The second dilatation exhibited the same circumstances in a more advanced stage. The coats of the vessels were more intimately adherent to each other, than in a natural state, but, it was evident, that the dilatation consisted in a dilatation of the internal, the middle, and the external coats of the aorta. In the large aneurism, the disorganized internal and middle coats could be traced for some distance into the sac, when the parts contained in the posterior mediastinum, and the vertebræ, formed the remainder of the cyst. There can be little doubt, that this sac commenced in a dilatation of the coats of the vessel, similar to those appearances which existed in the superior portion of the artery, and the dissection appeared to illustrate the formation of aneurism by partial dilatation in three distinct stages." (*Hodgson on the Diseases of Arteries and Veins, p.* 66, 68.)

This gentleman affirms, that he has seen this partial dilatation in almost all the arteries, which are subject to aneurism; at the division of the carotids, and iliacs; in the arteries of the brain, &c. He states that aneurisms at the origin of the aorta are generally formed by dilatation of the coats of the vessel.

"Partial as well as general dilatation (says Mr. Hodgson), frequently precedes the formation of aneurism in the arteries of the extremities. A gentleman had a large aneurism in the thigh, which had undergone a spontaneous cure. Upon examining the limb after death, the popliteal artery was found to be thickened and covered with calcareous matter. A small pouch, which would have contained the seed of an orange, originated from the side of this artery. This little sac was evidently formed by a dilatation of the coats of the vessel; for, the internal and middle coats could be traced in its circumference, and the former in that situation exhibited the same morbid appearances, which it possessed in other parts of the vessel. A man died from the sloughing of an aneurism in the ham. In the femoral artery there was a small aneurism, about as large as a walnut. The external coat was dissected from the surface of the tumour to a considerable extent. The internal and middle coats were evidently dilated, and contributed to the formation of the sac. The dilatation of these coats was gradual, and they continued for a considerable distance to form the sac, when they were inseparably blended with the surrounding parts." (*Op. cit. p.* 70.)

The facts adduced by Mr. Hodgson appear to be sufficiently conclusive, and in future I believe we must not be entirely governed by the authority even of a Scarpa, but admit with Mr. Hodgson as a more correct doctrine;

First, That numerous aneurisms are formed by destruction of the internal and middle coats of an artery, and the expansion of the external coat into a small cyst, which giving way from distention, the surrounding parts, whatever may be their structure, form the remainder of the sac.

Secondly, That sometimes the disease commences in the dilatation of a portion of the circumference of an artery. This dilatation increases until the coats of the vessel give way, when the surrounding parts form the sac, in the same manner as when the disease is in the first instance produced by destruction of the coats of an artery. (*P.* 74.)

The conclusions of Mr. Hodgson, as he himself explains, are supported by the observations of many preceding writers.

The learned Sabatier says, there can be no doubt, that many aneurisms depend upon the dilatation of the arterial coats; but, continues he, when this happens, the cases present remarkable differences. Sometimes the three arterial tunics are dilated altogether. In other instances only the two internal coats are affected with dilatation. *While, in far more numerous examples,* *the internal tunics are ruptured, and it is the cellular coat alone, which separates from them, and enlarges, so as to form the aneurismal sac; de sorte que les artères, qui sont dans ce cas, sont diloriquées, suivant l'expression de Lancisi.*

It is difficult to conceive, observes Sabatier, how all the coats of an artery can dilate and yield sufficiently to form the investment of such immense tumours as some aneurisms are. Indeed, that very tunic, which composes the greater part of the thickness of the vessel, and which is termed the *muscular coat,* is known to consist of fibres, whose texture is firm, and little capable of bearing extension. However, Sabatier states, that there are some observations, which prove, that the muscular tunic may become dilated as well as the others. Haller, in describing a very large aneurism, situated in the aorta near the heart, relates, that the innermost coat of this vessel was ruptured and torn, the loose jagged edges of the laceration being visible in the aneurismal sac. These were squamous, bony, and of little thickness; while the muscular and cellular coats were quite sound. Donald Monro noticed the same thing in five different aneurisms, which occurred in the course of the femoral and popliteal arteries of a man, who had been confined a long while to his bed, after submitting to the operation for the bubonocele. Monro succeeded in tracing the fibres of the muscular coat over the swellings so that he had no doubt of this tunic being dilated. Sabatier thinks, that it is not to be inferred, that all such writers, as have related the histories of true aneurisms, proceeding from a dilatation of all the arterial coats, can have been mistaken, although they have not minutely described the texture of the sac, in which the blood was contained. Yet, possibly, adds the same judicious writer, most of these aneurisms may have been of a similar kind to those, which result from the rupture of the internal tunics of the arteries, and the dilatation of the cellular coat; for, in such tumours, the fragments of the lacerated coats are often blended with osseous, steatomatous, or purulent matter, and confounded with the cellular coat that forms the exterior investment. (See *Médecine Opératoire, Tom. 3. p.* 160—162.)

The greater number of aneurisms increase gradually, and sooner or later incline to the side, on which the least resistance is experienced. De Haen mentions an aneurism of the aorta, which first made its appearance between the second and third ribs of the left side, and, which instead of growing larger, as is usual, subsided, and could neither be seen, nor felt, for more than a month before the patient's decease, although, on opening the body, a tumour of the arch of the aorta was found, three times as large as the first. De Haen imputes the sudden disappearance of the swelling to its weight, the yielding of the parts with which it was connected, and to its gravitating into the chest, when the patient lay on his right side; for, the difficulty of breathing, and other complaints, produced by the pressure on the lungs, underwent a material increase, as soon as the tumour ceased to protrude.

The pulsations, which accompany true aneurisms, continue to be strong, until the inner coats of the vessel give way, or the layers of coagulated blood, lodged in the sac, are numerous. Hence, when soft swellings, situated near any large arteries, lose their pulsatory motion, their course, precise situation, and other circumstances, ought to be most carefully investigated, before the surgeon ventures to make an opening. In many instances, the most fatal accidents have happened, in consequence of incisions having been made into aneurisms, which were mistaken for abscesses, because there was no pulsation. Vesalius was consulted about a tumour of the back, which he pronounced to be an aneurism. Soon afterwards, an imprudent practitioner made an opening in the swelling, and the patient bled to death in a very short time. Ruysch relates, that a friend of his, having opened a tumour near the heel, which was not supposed to be aneurism, the greatest difficulty was experienced in suppressing the hemorrhage. De Haen speaks of a patient, who died in consequence of an opening, which was made in a similar swelling at the knee, although Boerhaave had given his advice against the performance of such an operation. Palfin, Schlitting, Warner, and others, have recorded mistakes of the same kind. (*Sabatier, Tom. 3, p.* 167.) Richerand informs us, that Ferrand, head surgeon of the Hôtel-Dieu, mistook an axillary aneurism for an abscess, plunged his bistoury into the swelling, and killed the patient. *"J'ai été témoin d'erreurs semblables, commises par les praticiens non moins fameux; et si des anéurismes externes on passe à ceux des artères placées à l'intérieur, les erreurs ne sont ni moins ordinaires ni de moindre consequence."* (*Nosographie Chirurgicale, Tome* 4, *p.* 75. *Edit.* 2.)

Notwithstanding a pulsation is one of the most prominent symptoms of an aneurism, it is not to be inferred, that every swelling which pulsates is unquestionably of this description; for, as Mr. Warner has explained, "it does happen, that mere imposthumations, or collections of matter, arising from external as well as internal causes, are sometimes so immediately situated upon the heart itself, and, at other times, upon some of its principal arteries, as to partake, in the most regular manner, of their contraction and dilatation.

"A few years ago," says he, "I saw an instance of a boy, about thirteen years of age, who had his breast-bone much fractured by a fall; on this account, he was admitted into Guy's Hospital; but, not till a fortnight after the accident had happened.

"Upon examination, there was an evident separation of the broken parts of the bone, which were removed some distance from each other. The intermediate space was occupied by a tumour of a considerable size; the integuments were of their natural complexion. The swelling had as regular a contraction and dilatation as the heart itself, or the aorta could be supposed to have. Upon pressure, the tumour receded; upon a removal of the pressure, the tumour immediately resumed its former size; all these are allowed to be distinguishing signs of a recent true aneurism. The situation and symptoms of this swelling were judged sufficient reasons for considering the nature of the disease as uncertain: on which account it was left to take its own course.

"The event was, the tumour burst in about three weeks after his admission; discharged a considerable quantity of matter; and the patient did well by very superficial applications." (*Cases in Surgery, by Joseph Warner, F. R. S. Edit.* 4, *p.* 155.)

A few years ago, I saw a large abscess in the situation of the quadratus lumborum muscle, which pulsated so strongly, that the case was supposed by several experienced men to be an aneurism of the abdominal aorta. The patient was a boy, belonging to Christ's Hospital, and under the care of Mr. Ramsden, surgeon to that establishment, by whose discernment the real nature of the case was detected. It is curious, that, in this instance, the pulsations of the swelling suddenly ceased, after having continued in a very strong and manifest way, and without interruption, for several weeks, during which it was under the observation of the above eminent practitioner.

The following case, recorded by Pelletan, shews, that an artery running more superficially, than natural, may, under particular circumstances, give rise to the suspicion of an aneurism. A strong robust man, about forty years of age, was in the habit of going on foot to dine three leagues from Paris, every day, on the completion of his business. One day, having been this distance, and returned, he felt an acute pain along the leg, and in the right ankle. The pain did not subside, and a tumour appeared at the lower third of the leg, opposite the space between the two bones. The skin was of a yellowish colour from effused blood, and a pulsation existed, by which the hand of an examiner was lifted up. There seemed every reason for concluding that the case was an aneurismal swelling. In comparing the affected limb with the sound one, however, Pelletan perceived in the latter a similar kind of throbbing. In short, in both legs, the pulsation of an arterial tube could be felt for three inches, and, Pelletan distinctly ascertained, that, in the diseased member, the throbbing did not extend to the whole of the tumour, but only lengthwise. By a particular disposition in this individual, the anterior tibial artery, which usually runs along the interosseous ligament, covered by the tibialis anticus, and extensor communis digitorum pedis, came out from between these muscles, at the middle of the leg, and lay immediately under the skin and the fascia. The patient, curious about the circumstance, which had been mentioned to him, examined the legs of the whole of his family; and it appeared, that his daughter was the only one, in whom the anterior tibial artery ran directly under the skin, in the same way, as it did in himself.

By confining the patient to his bed, says Pelletan, we were soon convinced, that the disease was not an aneurism; for the swelling and ecchymosis were gradually dispersed, and, it is more than probable, that the symptoms originated from the rupture of some muscular fibres, in the exertion of walking so great a distance. (See *Pelletan's Clinique Chirurgicale, Tome* 1, *p.* 101, 102.)

According to Richerand, when an aneurism is recent and of small size, the dissection of the tumour exhibits a simple dilatation of the arterial coats; while, in other cases, where the aneurism is large, and has existed a considerable time, the internal and middle coats of the vessel are invariably lacerated. In the early stage of the disease, the blood, which fills the aneurismal sac, is fluid, and, on the contrary, in cases, where the internal tunics of the artery are ruptured, the sac contains more or less coagulated lymph. The external, or cellular coat composes the greater part of the cyst; and the coagulating lymph, with which it is filled, is arranged in layers, the density of which is described as being greater in proportion to the length of time, which they have been deposited. Such as are nearest the sac are, therefore, represented as being most compact, and containing the smallest quantity of the colouring matter of the blood; more deeply, the concretions of lymph resemble simple coagula; and lastly, the blood, which is still nearer the arterial tube, retains its fluidity.

After the aneurismal sac has been cleansed from the lymph and coagulated blood, which it contains, its parietes will appear to be almost entirely formed of the cellular coat of the artery. Towards the bottom may be observed the aperture, arising from the laceration of the internal and middle coats, which, being much less elastic than the external, are ruptured in an early stage of the disease. It is when these two tunics give way, that the aneurismal tumour undergoes a sudden and considerable increase in its size; for, then, the cellular coat alone has to sustain all the pressure of the blood, which, now becoming effused into a more ample cyst, loses a great deal of its impetus, coagulates, and forms fibrous masses; circumstances to which may be ascribed the hardness of the swelling, the weakness of its pulsation, &c.

The aneurisms, which get well spontaneously, are so few, that this disease, when left to itself, may be regarded as generally fatal. But, nothing is subject to more variety, than its duration in different cases, the tumour bursting sooner or later, according as the patient happens to lead a life of labour, or ease, of intemperance, or moderation. Even the bursting of an internal aneurism may not immediately kill the patient, as the following uncommon instance proves: a stonecutter died in the hospital Saint Louis with an enormous aneurism, situated on the left side of the lumbar vertebræ. The body was opened by Richerand, who found, that the external tumour consisted of blood, which had been effused into a cyst, that was formed in the midst of the cellular substance of the loins. This fluid had passed into the situation specified, by making its way through the muscles. The track, through which it came, led into another aneurismal sac, contained in the abdomen, and situated behind the peritoneum, on the left side of the lumbar vertebræ. In endeavouring to discover, whence the extravasated blood proceeded, Richerand found, that the abdominal aorta was entire, though in contact with the swelling. The original affection consisted of an aneurismal dilatation of the inferior portion of the thoracic aorta, which had burst at the point, where it lies betwixt the crura of the diaphragm. The blood had probably escaped very slowly, and it had accumulated in the cellular substance, which surrounds the kidney, so that three cysts had burst successively, before the patient died. (See *Richerand's Nosographie Chirurgicale, Tom.* 4, *p.* 82, *Edit.* 2.)

Aneurisms frequently destroy the bones with which they come into contact. There is perhaps hardly any surgeon who has not had many opportunities of seeing aneurismal swellings in the chest, forming an external protrusion, in consequence of the absorption of the ribs and sternum, or projecting backward against the spine, so as to occasion the destruction of the substance of the vertebræ.

J. L. Petit saw the condyles of the femur, and the upper head of the tibia almost destroyed by an aneurism of the popliteal artery; and there are few men of experience, who have not witnessed the same thing. According to Mr. Hodgson, the carious and corroded state of the bones in aneurism is never attended with the formation of pus; "at least, the discovery of pus in its vicinity has not been remarked by those, who have examined such cases. In this respect, therefore, it differs essentially from common caries, or ulceration of bones. Exfoliation also is very rarely attendant upon it; from which circumstance, one important practical observation is deducible, namely, that if the aneurism be cured, the bones will recover their healthy state, without undergoing those processes, which take place in the cure of caries or necrosis." (*Hodgson on the Diseases of Arteries and Veins, p.* 80.)

The same author confirms the remark made by Dr. W. Hunter (*Med. Obs. and Inquiries, Vol.* 1, *p.* 348.), that cartilage is less rapidly destroyed than bone.

The following case, related by Pelletan, is highly interesting, not only in exemplifying the degree, in which aneurismal swellings may injure the vertebræ; but also in shewing the liability of such tumours to be mistaken for other diseases, and the enormous size which they sometimes attain.

Francis Gensy was a robust healthy man, until the year 1803, when he met with a fall from his horse. From this period, he lost his usual gaiety and vivacity. Some time afterwards, he contracted the venereal disease, and put himself under the care of a quack. In 1805, supposing himself cured, he married. He had now become more dull, sorrowful, and pensive, than ever, and complained of pain about the kidneys, which he imputed to rheumatism. Last August, he was attacked with an intermittent fever, which readily yielded to suitable remedies. The following November, his horse fell down with him, and he communicated the accident to nobody; but, the pain about his kidneys became much more severe. It was not till the fourth of last March, that he consulted M. Deguise, a distinguished surgeon, belonging to the hospital at Charenton. Gensy complained of an acute pain in the left hip, which he described as shooting across the pelvis. As this circumstance caused rheumatism to be suspected, a blister was applied, which produced temporary relief, but was afterwards followed by convulsions of the whole body. Antispasmodics were prescribed with some success; yet, the tongue became dry, the belly tender, the pulse quick and small, the sleep uneasy, and the loins more painful than ever. Attempts were made to procure the patient relief by putting him repeatedly in the warm bath; but, this plan being annoying to him, it was relinquished. He suffered acute pain in the abdomen, and his nights were very bad. At length, on the 15th of the following April, an oval tumour, that was imperfectly circumscribed, made its appearance in the right iliac region, in the track of the psoas muscle. It presented a distinct fluctuation, and it might easily have been mistaken for a collection of matter depending, says Pelletan, on a caries of the vertebræ, the cause of which could have been referred to the venereal disease, of which mention has been made. But on an attentive examination, pulsations were felt, which, as they increased from day to day, left no further doubt concerning the nature of the swelling. It was at this period, that Pelletan was called into consultation with M. Deguise. The patient was now much emaciated; his pulse was scarcely perceptible; and his debility was extreme. Pelletan saw, that the disease was an aneurism, and could not but forebode the death of the patient. The deformity of the lowest dorsal vertebræ, where the centre of the pain lay, might have contributed to the idea of the case being a lumbar abscess with caries, had it not been known, that the enlargement of aneurisms may destroy the bodies of the vertebræ, as well as any other bone, which happens to be in the vicinity of the disease. The patient lived only ten days after Pelletan's visit.

On opening the body, an aneurismal tumour of prodigious size was discovered. It filled the cavity of the abdomen, from the lumbar and iliac regions of the right side, to the lumbar region of the left side, and it extended from the trunk of the cœliac artery down to the bifurcation of the aorta, into the two iliac arteries. The trunk of the aorta divided the tumour into two pouches, of which the right was far the largest, occupying the iliac and lumbar regions. The swelling enveloped the right kidney, and was externally covered with the peritoneum, which membrane was pushed to some distance from the bowels. The quantity of blood, which the aneurism contained, was about five pints; three of which were in its right cavity, and two in its left. This fluid was nearly all in a coagulated state, the coagula being arranged in concentric layers, as is usual in such cases. The centre of the disease presented an oval opening, about three inches long, and one broad, formed in the posterior part of the aorta, between the cœliac and superior mesenteric arteries. Opposite to this aperture, the bodies of the two last dorsal, and of the two first lumbar vertebræ, were destroyed; an ordinary effect of aneurism on such bones as happen to be near them, but, which effect Pelletan had never previously seen take place in so considerable a degree. The two cavities of the chest contained a large quantity of bloody serum, which had no connexion with the aneurism, and the lungs were sound.

Pelletan says, he never met with so large an aneurism; he thinks it probable, that it was brought on by the fall, which the patient met with in 1803, and that it had been increasing for six years. He states, that the man died from nearly the whole mass of the blood having passed into the aneurismal sac, most of the vessels, and the heart itself, being in fact quite empty.

However, the most interesting circumstance in this case, with regard to practice, was the resemblance, which the apparent symptoms of this aneurism bore to those of a lumbar abscess, with, or without a caries of the vertebræ. (See *Pelletan's Clinique Chirurgicale, Tom.* 1, *p.* 97—100.)

### CAUSES OF ANEURISM.

Aneurisms often seem to originate spontaneously, it being in many instances exceedingly difficult to assign any cause for the commencement of the disease. Among the circumstances, which predispose to aneurisms, however, the large size of the vessels may undoubtedly be reckoned. Those trunks, which are near the heart, are said to have much thinner parietes, in relation to the magnitude of the column of blood, with which they are filled, than the arteries of smaller diameter; and since the lateral pressure of this fluid against the sides of the arteries, is in a ratio to the magnitude of these vessels, it follows, that aneurisms must be much more frequent in the trunks near the heart, than in such as are remote from the source of the circulation. (*Richerand, Nosographie Chirurgicale, Tom.* 4, *p.* 72, *Edit.* 2.) The whole arterial system is liable to aneurisms; but, says Pelletan, experience proves, that the internal arteries are much more frequently affected, than those which are external. (*Clinique Chirurgicale, Tom.* 1, *p.* 54.)

The curvatures of the arteries are another predisposing cause of the disease, and, according to Richerand, such cause has manifest effect in determining the formation of the great sinus of the aorta, the dilatation, which exists between the cross and the origin of this large artery, and is the more considerable, the older the person is. Monro goes as far as to say, that one half of old persons have an aneurism at the beginning of the aorta.

There is one artery of moderate size, without any curvature, which is nevertheless more subject to aneurism, than other vessels of much larger diameter: the popliteal artery is here alluded to. The crural, of which this last is only the continuation, is much less commonly affected. This frequency of aneurisms of the popliteal artery does not depend upon the vessel being situated in the middle of a very extensible cellular substance; for, the crural, at its upper third, is not better supported by the surrounding parts. The cause is imputed by Richerand to the situation of the artery in the ham, at the back of the knee joint, an articulation, of which the extension is only limited by the resistance of such tendons, ligaments, and soft parts, as are placed behind it. In the stretching, to which all the parts behind the joint are subjected, when the leg is forcibly extended on the thigh, the artery, whose texture is the slightest, is particularly apt to be lacerated. Richerand affirms, that, out of twelve popliteal aneurisms, which he has seen, either in hospital, or private practice, ten have been caused by a violent extension of the leg. This statement, he says, will derive confirmation from the following experiments:

Place the knee of a dead subject on the edge of a firm table, and press on the heel, so as forcibly to extend the leg far enough to make the ligaments of the ham snap. Now dissect the part, cut out the artery, and examine its parietes in a good light, when the lacerations of the middle coat will be observable, and rendered manifest by the circumstance of those places appearing semitransparent, where the fibres are separated, the parietes at such points merely consisting of the internal and external tunics. (*Nosographie Chir. Tom. 4, p. 73, 74, Edit. 2.*)

The implicit belief, however, which Richerand seems to place in the idea, that the laceration of the middle coat of an artery will bring on an aneurism, while the inner coat is perfect, will appear to be unfounded, when it is remembered, that Hunter, Home, and Scarpa, even dissected off the external and middle coats of arteries, without being able in this manner to cause an aneurism.

Pelletan accounts for the frequency of popliteal aneurisms somewhat differently from Richerand: speaking of the two principal motions of the knee, viz. extension and flexion, he remarks, that the first of these is so limited, that it is actually an incipient flexion, necessarily produced by the curvature backward both of the condyles of the femur, and those of the tibia. This curvature, which would seem to protect the popliteal artery against any dangerous elongation, that might otherwise be caused by a forcible extension of the joint, becomes the very source of such an elongation in persons, who are accustomed to keep their limbs bent, or, who, from this state, proceed hastily and violently to extend the leg. The arterial tubes are really shortened, when the limbs are in the state of flexion, and lengthened, when the extension of the members renders it necessary. Hence, says Pelletan, it is manifest, that an habitual shortened state of these vessels, and their sudden elongation, must be attended with hazard of rupturing their parietes. (*Clinique Chirurgicale, Tom. 1. p. 112.*)

Aneurisms are exceedingly common in the aorta, and they are particularly often met with in the popliteal artery. The vessels, which are next to these the most usually affected, are the crural, common carotid, subclavian, and brachial arteries. The temporal and occipital arteries, and those of the leg, foot, forearm, and hand, are far less frequently the situations of the present disease. But, although it is true, that the larger arteries are the most subject to the ordinary species of aneurisms, the smaller arteries seem to be more immediately concerned in the formation of one peculiar aneurismal disease, now well known by the name of the *aneurism by anastomosis*, of which I shall hereafter speak.

According to surgical writers, the causes of aneurisms operate either by weakening the arterial parietes, or by increasing the lateral impulse of the blood against the sides of these vessels. It is said to be in both these ways, that the disease is occasioned by violent contusions of the arteries, the abuse of spirituous drinks, mercurial courses too often repeated, fits of anger, rough exercises, exertions in lifting heavy burdens, &c. In certain persons, aneurisms appear to depend upon a particular organic disposition. Of this description was the subject, whose arteries, on examination after death, were found by Lancisi affected with several aneurisms of various sizes. I have known a person have an aneurism of one axillary artery, which disease got spontaneously well, but, was soon afterwards followed by a similar swelling of the opposite axillary artery, which last affliction proved fatal. I have seen another instance, in which an aneurism of the popliteal artery was accompanied with one of the femoral in the other limb. Boyer mentions a patient, who died of a femoral aneurism in la Charité, at Paris, and who had also another aneurism of the popliteal artery, equal in size to a walnut. (*Boyer's Traité des Maladies Chirurgicales, &c. p.* 102, *T.* 2.) The most remarkable case, however, proving the existence of a disposition to aneurisms in the whole arterial system, is mentioned by Pelletan. "J'ai pourtant vu plusieurs fois ces nombreux aneurismes occupant indistinctement les grosses ou les petites artères, mais sur-tout celles des capacités; *j'en ai compté soixante-trois sur un seul homme, depuis le volume d'une aveline jusqu' à celui de la moitié d'un œuf de poule.* (*Clinique Chirurgicale, Tom.* 2, *p.* 1.)

Aneurisms, and those diseases of the coats of arteries, which precede the formation of aneurism, are much less frequently met with in women, than men. (*Lassus Pathologie Chir. T.* 1, *p.* 348.) Mr. Hodgson, in his valuable treatise, has published the following table, exhibiting the comparative frequency of aneurisms in the two sexes in different cases of this disease, and also in the different arteries of the body, as deduced from examples, either seen by himself, during the lives of the patients, or soon after their death.

| | Total. | Males. | Females. |
|---|---|---|---|
| Of the ascending aorta, the arteria innonimata, and arch of the aorta - - | 21 | 16 | 5 |
| Descending aorta - - | 8 | 7 | 1 |
| Carotid artery - - - | 2 | 2 | |
| Subclavian and axillary | 5 | 5 | |
| Inguinal artery - - | 12 | 12 | |
| Femoral and popliteal - | 15 | 14 | 1 |
| | 63 | 56 | 7 |

This table does not include aneurisms arising from wounded arteries, nor aneurisms from anastomosis. (See *Hodgson's Treatise on the Diseases of Arteries and Veins, p.* 87.)

In this country it has been noticed, that popliteal aneurisms occur with particular frequency in postilions and coachmen, whose employments oblige them to sit a good deal with the knees bent. It has been observed in France, by Richerand, that the men, who clean out the dissecting rooms, and procure dead bodies for anatomists, almost all die of aneurismal diseases. This author remarks, that he never knew any of these persons, who were not addicted to drinking, and he comments on the debility, which their intemperance and disgusting business together must tend to produce. (*Nosographie Chirurgicale, Tom.* 4. *p.* 74, *Edit.* 2.)

Aneurisms of the axillary artery appear, in some instances, to have arisen from violent extension of the limb. (See the cases recorded by Pelletan in *Clinique Chirurgicale, Tom.* 2, *p.* 49, and 83.) In other examples, related by the same interesting practical writer, aneurisms arose from reiterated contusions and rough pressure on parts. (*Op. cit. p.* 10, *p.* 14.)

The extremity of a fractured bone may injure an artery, and give rise to an aneurism, an instance of which is recorded by Pelletan. (*Op. cit. Tom.* 1. *p.* 178.) The disease followed a fracture of the lower third of the leg. An aneurism of the anterior tibial artery, from such a cause, is also described in Mr. *Charles White's Cases in Surgery, p.* 141.

The following case of an aneurism of the humeral artery, after amputation, is recorded by Warner: C. D. was afflicted with a caries of the joint of the elbow, which was attended with such circumstances, as rendered the amputation of the limb necessary. The operation was performed at a proper distance above the diseased part, and the vessels were taken up by the needle and ligatures.

In a few days, after the operation, the humeral artery became so dilated above the ligature as to endanger its bursting. Upon this account, it was judged necessary to perform the operation for the aneurism, which was done, and the vessel was secured by ligature, above the upper extremity of its distended coats. After this operation, every thing went on, for some time, exceedingly well, when suddenly the artery appeared again dilated, and was in danger of bursting above the second ligature. These circumstances made it necessary to repeat the operation for the aneurism. From this time, every thing went on successfully, till the stump was at the point of being healed; when, quite unexpectedly, the artery appeared a third time diseased in the same manner as before; for which reason, a third operation for aneurism was determined on, and performed.

The last operation was near the axilla. The patient continued well from this time, without any relapse.

Query. Could the several aneurisms of the humeral artery, (says Mr. Warner) be attributed to the sudden check alone, which the blood met with from the extremity of the vessel being secured by ligature; or is it not more reasonable to suppose, that the coats of the artery, nearly as high up as the axilla, were originally diseased and weakened? The latter, in the opinion of this judicious writer, seems the most probable way of accounting for the successive returns of the disease of the vessel; since it is found from experience, that such accidents have been very rarely known to occur after amputations, either of the arm, or thigh, where nearly the same resistance must be made to the circulation in every subject of an equal age and vigour, who has undergone the like operation.

If it should be supposed that the several dilatations of the coats of the vessels, continues Mr. Warner, arose merely from the check in the circulation, it will not be easy to account for the final success of this operation; and, especially when we reflect, that the force of the blood is increased in proportion to its nearness to the heart. (See *Cases in Surgery, by J. Warner, F. R. S. p.* 139, 140, *Edit.* 4.)

Ruysch has related an observation somewhat similar. (*Obs. Anat. Chir. T.* 1. *p.* 4.)

Aneurisms sometimes follow the injury, which a large artery suffers in gunshot wounds. The passage of a bullet through the thigh, in one example, gave rise to a femoral aneurism. (See *the Parisian Chirurgical Journal, Vol.* 2, *p.* 109.)

The same cause produced an aneurism high up the thigh of a soldier, who was under the care of my friend staff-surgeon Collier at Brussels, after the battle of Waterloo.

### PROGNOSIS.

In cases of aneurism, the prognosis varies according to a variety of important circumstances. The disease may generally be considered as exceedingly dangerous; for, if left to itself, it at length bursts, and the patient dies of hemorrhage. There are on record, however, some examples, in which a spontaneous cure took place, and aneurismal swellings have been known to lose their pulsation, become hard, smaller, and gradually reduced to an indolent tubercle, which has entirely disappeared. After death, the artery in such instances, has been found obliterated, and converted into a ligamentous cord, without any vestige of the aneurism being left. Aneurisms are also sometimes attacked with mortification; the sac and adjacent parts slough away; the artery is closed with coagulum; and a cure is thus effected. Lastly, tumors, having all the character of aneurisms have been known to disappear under the employment of such pressure, as was certainly too feeble to intercept entirely the course of the blood. Such examples of success, however, are not common, and whenever they happen, it is because the entrance of blood into the sac is prevented by that already contained in it having coagulated, and the artery above the swelling becomes filled with coagulum. They must, in fact, have been cured on the very same principle which renders the surgical operation successful.

Every external aneurism situated so close to the trunk, that it cannot be compressed, nor tied above the swelling, is for the most part absolutely incurable. But, it should be recollected, that sometimes the size of the swelling appears to leave no room for the application of a ligature above it, while things are in reality otherwise, in consequence of the communication between the sac and the artery, bearing no proportion to the magnitude of the tumor itself. At the present day, also enlightened by anatomical knowledge, and encouraged by successful experience, surgeons boldly follow the largest arteries, even within the boundaries of the chest and abdomen, as we shall presently relate, and numerous facts have now proved, that very few external aneurisms are beyond the assistance of modern surgery. It being certain that aneurisms cannot commonly be cured, except by an obliteration of the affected artery, it follows, that the circulation must be carried on by the superior and inferior collateral branches, or else the limb will mortify. Experience proves, that the impediment to the passage of the blood, through the diseased artery, obliges this fluid to pass through the collateral branches, which gradually acquire an increase of size. It is therefore a common notion, that it must be in favour of the success of the operation, if the disease be of a certain standing; and Boyer even asserts, that the most successful operations have been those performed on persons, who have had the disease a long while. (*Traité des Maladies Chirurg. T.* 2, *p.* 116.)

There is this objection to delay, however, that the tumor becomes so large, and the effects of its pressure so extensive and injurious, that, after the artery is tied, great inflammation, suppuration, and sloughing, often attack the swelling itself, and the patient falls a victim to what would not have occurred, had the operation been done sooner.

The large size of an aneurism, as Mr. Hodgson has rightly observed, is a circumstance, which materially prevents the establishment of a collateral circulation. When the tumour has acquired an immense bulk, it has probably destroyed the parts, in which some of the principal anastomosing branches are situated; or by its pressure it may prevent their dilatation. (See *Hodgson on the Diseases of Arteries and Veins, p.* 259.) The practice of permitting an aneurism to increase, that the collateral branches may become enlarged, (says this gentleman) is not only unnecessary but injurious, inasmuch as that the increase of the tumour must be attended with a destruction of the surrounding parts, which will render the cure of the disease more tedious and uncertain. (*P.* 266.)

The most successful operations, which I have seen, were performed before the aneurismal swellings were very large.

The surgeon should not be afraid of operating, although appearances of gangrene may have taken place on the tumour; for, as Mr. Hodgson remarks, should it burst afterwards, it is probable, that both extremities of the artery in the sac will be closed with coagulum. (*Hodgson, p.* 305.) Mr. A. Cooper tied the external iliac artery in two cases of inguinal aneurism, when gangrene existed, and though the tumours burst, no hemorrhage ensued. The coagulum was discharged; the sac granulated; and the sores gradually healed. (*Medico Chir. Trans. Vol.* 4, *p.* 431.)

The necrosis, or caries of the bones, is an extremely unpleasant complication, and it may, according to writers, sometimes induce a necessity for amputation (*Boyer, Traité des Mal. Chir. T.* 2, *p.* 117), though I have never seen a case of this description; and Mr. Hodgson, as we have already explained, informs us, that the affection of the bones is hardly ever attended with exfoliations, or the formation of pus, so that if the aneurism can be cured, the bones will recover their healthy state, without undergoing those processes, which take place in the cure of caries, or necrosis. (*On Diseases of Arteries and Veins, p.* 80.)

The age, constitution, and state of the patient's health, are also to be considered in the prognosis; for they undoubtedly make a great difference in the chance of success after the operation.

The operation, says an accurate observer, should not be omitted on account of the age of the patient, if the circumstances of the case in other respects appear to demand it, for it has often succeeded at very advanced periods of life. "I have seen several aneurisms cured by the modern operation, in patients above sixty years of age." (*Hodgson, p.* 304.)

When an aneurism exists in the course of the aorta, the violent action of the heart, excited by an operation in the extremities, may cause it to burst, and prove instantaneously fatal. Two cases have recently occurred in this metropolis, in which the patients died from such a cause during operations for popliteal aneurisms. (See *Hodgson on Diseases of Arteries, p.* 306. *London Med. Review, Vol.* 2. *p.* 240, *and Burns on Diseases of the Heart, p.* 226 ) Should the co-existence of the internal aneurism be known, the operation for the other tumour is improper, and the surgeon should limit the treatment to palliative means.

Experience confirms, however, that the circumstance of there being two aneurisms in the limbs should not prevent the operation, which is to be practised at separate periods. Facts in support of this statement are quoted by Mr. Hodgson. (*P.* 310.)

### OF THE SPONTANEOUS CURE AND GENERAL TREATMENT OF ANEURISMS.

The obliteration of the sac, in consequence of a deposition of lamellated coagulum in its cavity, as Mr. Hodgson has well described, is the mode, by which the spontaneous cure of aneurism is in most instances effected. The blood soon deposits upon the inner surface of the sac, a stratum of coagulum; and successive depositions of the fibrous part of the blood by degrees lessen the cavity of the tumour. At length, the sac becomes entirely filled with this substance, and the deposition of it generally continues in the artery on both sides of the sac as far as the giving off of the next large branches. The circulation through the vessel is thus prevented; the blood is conveyed by collateral channels; and another process is instituted, whereby the bulk of the tumor is removed (*Hodgson on the Diseases of Arteries,* &c. *p.* 114.)

Such desirable increase of the coagulated blood in the sac is indicated by the tumor becoming more solid, and its pulsation weak, or ceasing altogether. Another mode, in which the disease is spontaneously cured, happens as follows: an aneurism is sometimes deeply attacked with inflammation and gangrene; a dense, compact, bloody coagulum, is formed within the vessel, shutting up its canal, and completely interrupting the course of the blood into the sac. Hence, the sphacelation which follows, and the bursting of the integuments and aneurismal sac are never accompanied by a fatal hemorrhage; and the patient is cured of the gangrene and the aneurism, if he has strength sufficient to bear the derangement of the health necessarily attendant on so considerable an attack of inflammation and gangrene.

When a patient dies of hemorrhage, after the mortification of an aneurism, it is because only a portion of the integuments and sac has sloughed, without the root of the aneurism, and especially the arterial trunk, being similarly affected. For cases illustrative of this statement, refer to *Hodgson on Diseases of Arteries, p.* 103, &c.

A third way, in which an aneurism may be spontaneously cured, is by the tumor compressing the artery above, so as to produce adhesion of its sides, and obliteration of its cavity. This mode of cure must be uncommon. It has been adverted to by Sir E. Home, Scarpa, Dr. Thomson, and others; but, some facts tending to prove it have been collected by Mr. Hodgson, and are published in his useful work. (See *p.* 107, &c.)

"The surgical treatment of aneurism, (says this gentleman) consists in the obliteration of the cavity of the artery communicating with the sac, so that the ingress of the blood into the latter is either entirely prevented, or the stream which passes through it is supplied only by anastomosing branches, and consequently the force of the circulation is so much diminished, that the increase of the tumour is prevented, and the deposition of coagulum is promoted. By the absorption of its contents, and the gradual contraction of the sac, the cure is ultimately accomplished. The blood is conveyed to the parts, which it is destined to supply, by collateral vessels, some of which being gradually enlarged, constitute permanent channels for the circulation. The obliteration of the artery is effected by the excitement of such a degree of inflammation in its coats, as shall produce adhesion of its side. These objects have been attempted by the compression or the ligature of the artery. The latter method constitutes the operation for aneurism." (*P.* 165.)

According to Scarpa, a complete cure of an aneurism cannot be effected, in whatever part of the body the tumour is situated, unless the artery, from which the aneurism is derived, be, by nature or art, obliterated and converted into a perfectly solid, ligamentous substance, for a certain extent above and below the place of the ulceration, laceration, or wound. When aneurisms are cured by compression, the cure is never accomplished, as some have supposed, by the pressure strengthening the dilated proper coats of the artery, and restoring, especially to the muscular coat, the power of propelling the blood along the tube of the artery, as it did previously to its *supposed dilatation.* M. Petit, and Foubert thought, that the natural curative process sometimes consisted in a species of clot, which closed the laceration, ulceration, or wound of the artery, and resisted the impulse of the blood, so as still to preserve the continuity of the coats of the artery, and the pervious state of the vessel. Haller imbibed a similar sentiment, from experiments made on frogs.

That a punctured artery may occasionally be healed in this manner, Scarpa proves by a case which he examined, in which an aneurism took place from the wound of a lancet in bleeding. In the article *Hemorrhage* we shall see, that Jones's experiments shew the same thing, and the particular circumstances in which it may happen. But, the occurrence is excessively rare, and can hardly be called a *radical* cure, as the cicatrix is always found in a state ready to burst and break, if the arm is, by any accident, violently stretched or struck, where the wound was situated.

Whenever the ulcerated, lacerated, or wounded artery, is accurately compressed against a hard body, like the bones, it ceases to pour blood into the surrounding cellular sheath, because its sides, being kept in firm contact, for a certain extent, above and below the breach of continuity, become united by the adhesive inflammation, and converted into a solid, ligamentous cylinder. Molinelli, Guattani, and White, have given examples and plates illustrative of this fact. When aneurisms get well spontaneously, the same fact is observed after death, as Valsalva, Ford, &c. have demonstrated. I have myself seen in St. Bartholomew's Hospital, an instance, in which a man had had a spontaneous cure of an aneurism in the left axilla, but afterwards died of hemorrhage from another one under the right clavicle; the artery on the left side was found completely impervious. My friend, Mr. Albert, had under his care, in the York Hospital, Chelsea, a dragoon, who recovered spontaneously of a very large aneurism of the external iliac artery: the tumor sloughed, discharged about two quarts of coagulated blood, and then granulated and finally healed up. Paoli relates a similar termination of a popliteal aneurism. Moinichen and Guattani, relate other examples Hunter found the femoral artery quite impervious, and obliterated, at the place where a ligature had been applied fifteen months before. Boyer noticed the same fact in a subject, eight years after the operation. Petit relates a spontaneous cure of an aneurism at the bifurcation of the right carotid, and the subject having afterwards died of apoplexy, the vessel, on dissection, was found closed up and obliterated from the bifurcation, as far as the right subclavian artery. Desault had an opportunity of opening a patient, in whom a spontaneous cure of a popliteal aneurism was just beginning; he found a very hard, bloody thrombus, which extended for three finger-breadths, within the tube of the artery, above the sac, and was so firm, as to resist injection, and make it pass into the collateral branches.

Both the spontaneous and surgical cures of aneurisms have two stages; in the first, the entrance of the blood into the aneurismal sac is interrupted; in the second, the parietes of the artery approach each other, and, becoming agglutinated, the vessel is converted into a solid cylinder. This doctrine is corroborated by the tumor first losing its pulsation, and then gradually diminishing and disappearing.

In order that compression may make the opposite sides of an artery unite, and thus produce a radical cure of an aneurism, Scarpa says, the degree of pressure must be such as to place these opposite sides in firm and complete contact, and such as to excite the adhesive inflammation in the coats of the artery, which must also possess a state of vitality, presently to be noticed. The point of compression must also fall above the laceration or wound of the artery; for, when it operates below, it hastens the enlargement of the tumour; and Scarpa adds, that, in practice, bandages, which are expulsive and compressive, are more useful for making pressure, than any tourniquets or instruments, many of which are contrived to operate, without retarding the return of blood through the veins.

For pressure to succeed, the coats of the vessel must possess, at the place where it is made, such a degree of vitality, as to be capable of feeling the stimulus, and of inflaming. When the arterial coats, round the root of the aneurism, are diseased, as above described, they are insusceptible of the adhesive inflammation, although compressed together in the most scientific manner, and, even when tied with a ligature, which only acts by making circular pressure on the vessel.

Some advise trying compression in every case of aneurism, whether small, circumscribed, soft, flexible, indolent, or elevated, diffused, hard, and painful. In the latter case, however, compression is hurtful. Every bandage, which compresses the aneurism, and also constricts circularly the affected part, is always injurious. The bandage, likewise, which, compressing only the aneurism, directs the point of pressure below the rupture in the vessel; that which, on account of the great size, exquisite sensibility, depth of the root of the aneurism, and fleshiness of the surrounding parts, cannot effectually compress the artery against the bones, so as to bring the opposite side of the vessel into contact; and, lastly, the compression applied to a spontaneous aneurism, attended with a steatomatous, ulcerated, earthy disease of the arterial coats, ought to be considered as an useless, or rather hurtful plan. In cases of a completely opposite description, bandages have produced, and may produce, radical cures of aneurism, and should not be entirely disused.

Guattani first employed compression systematically for the cure of aneurisms, and he has related many cases, in which he succeeded. Freer details other examples; but, in general, pressure has hitherto been applied to the tumour itself, a method less likely to answer, than that of making pressure on a sound part of the artery. Mr. Freer recommends the employment of Sennfio's instrument, or the following method: first place a bandage moderately tight, from one extremity of the limb to the other; then place a pad upon the artery, a few inches above the tumour; next, surrounding the limb with a tourniquet, let the screw be fixed upon the pad, having previously secured the whole limb from the action of the instrument, by a piece of board wider than the limb itself, by which means the artery only will be compressed, when the screw is tightened. The tourniquet should now be twisted till the pulsation in the tumour ceases. In a few hours the limb will become œdematous and swelled, when the tourniquet may be removed, and the pressure of a pad and roller will afterwards be enough. By experiments which this gentleman made on the radial arteries of horses, these vessels were found to become inflamed, and to be rendered impervious by such a process.—(*Freer, p.* 112.)

Mr. A. Cooper mentions an excellent machine for compressing the femoral artery, in cases of popliteal aneurism. It was used by Sir W. Blizard.

"The points of support for this instrument were the outer part of the knee, and the great trochanter, a piece of steel passing from one to the other; and to the middle of this a semicircular piece of iron was fixed, which projected over the femoral artery, having a pad at its end, moved by a screw, by turning which, the artery was readily compressed, and the pulsation in the aneurism stopped, without any interruption to the circulation in the smaller vessels." But, although the patient on whom it was tried possessed unusual fortitude of mind, and indifference to pain, he was incapable of supporting the pressure of the instrument longer than nine hours. Indeed the agony arising from long continued pressure is insupportable to almost all men. (*Mem. and Phys. Journal, Vol.* 8.)

The grand means most to be depended upon, however, for curing aneurisms, is tying the artery above the tumour. This more certainly prevents the usual ingress of blood into the sac, and, what is more important, more certainly excites the adhesive inflammation, by dividing the internal coats of the vessel. The blood in the sac is afterwards gradually absorbed, and the tumour dwindles away in proportion. The natural course of the blood being now permanently interrupted in the arterial trunk, it passes more copiously into the collateral branches, and these enlarging and anastomosing with others, which originate from the large arteries beyond the obstruction, the necessary circulation is carried on. (See *Anastomosis.*)

The ligature of the superficial femoral artery, may be performed with the same confidence of success, as the ligature of the brachial artery, that is, without any fear of destroying the circulation, or depriving the subjacent limb of its vitality. Indeed, the numerous and conspicuous anastomoses, which are met with all round the knee, correspond exactly with those which are observed round the elbow, and at the bend of the arm. This is not a peculiarity of the arteries of the extremities, but it is a general rule which nature has followed in the distribution of all the arteries, that the superior trunks communicate with the inferior, by means of the lateral vessels. After the principal trunk of an artery is tied, its lateral branches not only carry on the circulation in the parts below the ligature, but do so with greater quickness and activity than they did before, when the course of the blood was unimpeded through the principal trunk. This evidently arises from the increase of pressure which the blood, that takes the rout of the lateral vessels, receives, as well as from the enlargement in the diameter of these vessels. After the amputation of the thigh, while the blood flows in a full stream from the superficial femoral artery, very little or no blood is poured out of the lateral vessels; but as soon as that artery is tied, the blood issues with impetuosity from the small arteries which run along, within the vasti and cruræus muscles; and, on these smaller arteries being also tied, the blood immediately oozes out, from the minute arterial vessels of the muscles and cellular membrane. When the principal trunk of an artery is tied, its lateral branches gradually acquire a much larger diameter. After amputation of the thigh, on account of a popliteal aneurism, the size and situation of which could not fail materially to impede the course of the blood through the trunk of the femoral artery, it has been often remarked, that, although both the trunk and the greater and smaller branches, had been tied with the greatest accuracy, the patients have been in danger of losing their lives, on account of the repeated copious hemorrhages from the innumerable small lateral vessels, that had become unusually enlarged. In several cases during the treatment, and especially after the radical cure of popliteal aneurism, by tying the superficial femoral artery, in the upper third of the thigh, all the ramifications of the recurrent popliteal arteries have been felt beating strongly round the knee. We have already noticed, that Boyer found, in a man, who some years before had been operated on for a popliteal aneurism, but had afterwards died from a caries of the tibia, that an arterial branch, which runs through the substance of the sciatic nerve, was dilated so much, as to be equal in diameter to the radial artery. White, in dissecting the arm of a lady, who, fifteen years before had been operated on for an aneurism in the bend of the arm, found the brachial artery obliterated, and converted into a solid cylinder, for three inches below the place of the ligature, and as far as the division into the radial and ulna arteries; but, the recurrent radial and ulnar branches had become so much enlarged, that, taken together, they exceeded the size of the brachial artery, above the situation of the ligature. In the dead body it is found, that an anatomical injection will pass more freely from one extremity to the other of an aneurismatic, than of a sound limb, and this, even when no vessels are visibly enlarged. Although it be self-evident, that the circulation through the collateral vessels ought to be much more easy and quick the lower down the ligature is applied to the principal trunk; yet experience shews, that this difference is not to be estimated very high; for in cases of popliteal aneurism, *cæteris paribus,* the success is the same, whether the femoral artery be tied very low down, or very high up in the thigh. (*Scarpa.*)

This facility of the passage of the blood through the lateral vessels, is not the same in subjects of all ages; and, in the same subject, it is not the same in the inferior, as in the superior extremity. An age under forty-five, and the operation being done on the arm, which is nearer the source of the circulation, than the lower extremity, increase the chance of success.

The circumstances chiefly preventive of success, especially in the popliteal and femoral aneurisms, are the following: Rigidity, atony, or disorganization of the principal anastomoses, between the superior and inferior arteries of the ham and leg; sometimes depending on an advanced age, or on it, together with the large size of the aneurism, which, by long continued pressure, has caused a great change in the neighbouring parts: or sometimes on steatomatous, ulcerated, earthy, cartilaginous, disorganization of the proper coats of the artery, not confined to the seat of the rupture, but extending a great way above and below the aneurism, and also to the principal popliteal recurrent arteries, tibial arteries, and occasionally, to portions of the whole track of the superficial femoral artery. Sometimes, the pressure of large aneurisms, renders the thigh bone carious. In such circumstances the ligature is apt to fail in closing the trunk of the artery; and, if it should succeed, the state of the anastomosing vessels will not admit of a sufficient quantity of blood being conveyed into the lower part of the limb. Hence, when the patient is much advanced in life, languid and sickly, when the internal coat of the artery is rigid, and incapable of being united by a ligature; when the aneurism is of long standing, and considerable size, with caries of the os femoris, or tibia; when the leg is weak and cold, much swelled, heavy, and œdematous; Scarpa considers the operation contra-indicated. I must, however, declare in this place, that I have seen very large aneurisms, as well as aneurisms in persons of advanced age, cured by the Hunterian plan, in St. Bartholomew's Hospital.

It appears, then, that the obliteration of the artery, for a certain extent above and below the place of rupture, forms the primary indication in the radical cure of aneurism, whether compression or the ligature, be employed. All other means are only auxiliary. Internal remedies may be useful in so far as they tend to moderate the determination of the blood towards the place, where the artery has been tied or compressed. Bleeding in young, very robust, plethoric patients, low diet, diluent drinks, gentle laxatives and glysters, mental and bodily rest, and cool air, have such effect. When there is weakness, not from age, but from pain, long want of rest, or loss of blood, tonics, cordials, and a moderate diet, may be given. Scarpa also advises the outward use of corroborants and stimulants; but, I think, few English surgeons will approve the practice.

Notwithstanding, however, aneurisms cannot in general be cured, as Scarpa has explained, unless the artery be rendered impervious for some extent above and below the tumour, I believe, we must make an exception to this observation, with respect to the few aneurisms of the aorta, (especially those of its arch), which, according to the records of surgery, have been diminished and cured by Valsalva's treatment. In such examples, we are not to suppose, that the aorta becomes obliterated at its very beginning; but, that the diminution of the quantity of circulating blood, the reduced impetus of this fluid, the lessened distention of the aneurismal sac, the general weakness induced in the constitution, and the increased activity of the lymphatic system, all necessary effects of Valsalva's method, have combined to bring about a partial subsidence of the tumour.

" It is a common opinion, (says Mr. Hodgson)that the radical cure of an aneurism cannot take place, without the obliteration of the artery from which the disease originates. It is probably owing to this idea, that aneurisms of the aorta have generally been considered as incurable diseases, and consequently that so little attention has been given to their treatment." (*P.* 118.) The facts, however, which this gentleman has related, satisfactorily prove, 1st, That a deposition of coagulum may take place in an aneurismal sac, to such an extent as entirely to preclude the communication between its cavity and that of the artery from which it originates. 2dly, That a sac, thus filled with coagulum, cannot prove fatal by rupture; and 3dly, That the gradual absorption of its contents, and the consequent contraction of the sac, may proceed to such an extent as to effect the cure of the disease, without any obstruction taking place in the calibre of the vessel, from which it originates. See cases, 20, 21, 22, &c. (*Hodgson on Diseases of the Arteries, &c. p.* 119, *&c.*) In support of this doctrine, Mr. Hodgson has also cited some facts recorded by Corvisart, (*Essai sur les Maladies du Cœur, p.* 313, *&c ;)* and he adduces other observations, which tend to prove, that aneurisms of smaller arteries than the aorta, may occasionally get well, without the perviousness of such vessels at the diseased part being destroyed.

The same gentleman has likewise published a case, communicated by Mr. A. Cooper, where a cure of a femoral aneurism, attended with dilatation of the whole circumference of the vessel, was accomplished by a deposition of coagulum, through the centre of which a canal remained, by which the continuity of the tube was preserved. (See case 25, *op. cit.*)

In the articles *Hemorrhage*, and *Ligature*, I have related in detail the effects of the ligature upon a tied artery, and particularly the various processes which arise from its application, and permanently obliterate the vessel. In the same places, I have explained what are the best ligatures for use, as well as the safest manner of using them. I shall here therefore briefly annex the following practical directions and conclusions as stated by Mr. Hodgson.

First, The cord should be thin and round, such a ligature being most likely to effect a clean division of the internal and middle coats of the vessel, and not liable to occasion extensive ulceration or sloughing.

Secondly, The ligature should be tied very tightly, in order to insure the complete division of the internal and middle coats, and to prevent its detachment, it being almost impossible, even with the thinnest ligature, entirely to cut through a healthy artery.

Thirdly, The vessel should be detached from its connexions only to such an extent as is necessary for the passage of the ligature underneath it.

Fourthly, The immediate adhesion of the wound should be promoted by all those means which assist that process in general.

Lastly, Experience having proved, that secondary hemorrhage more frequently arises from an improper mode of tying the artery, or of treating the wound, than from the condition of an undivided artery, the practice of applying two ligatures and dividing the vessel in the interspace is not an essential object. But, in situations, where there is a vigorous circulation at both ends of the vessel, the application of two ligatures is advisable. (See *Hodgson on the Diseases of Arteries, p.* 225, 226.)

In the course of his experiments upon brutes, to ascertain the operation of the ligature, Dr. Jones arrived at a fact, which offered the probability of leading to an improvement in the operation for aneurism. (*Treatise on Hemorrhage, chap.* 3.) When a ligature is applied to an artery, it causes a division of the internal and middle coats; and if it be afterwards removed, an effusion of lymph takes place between the cut surfaces into the cavity of the vessel. If several divisions of the internal and middle coats be thus effected in the vicinity of each other, the effusion of lymph was found by Dr. Jones to be sufficiently extensive to obliterate the cavity of the vessel. If immediately after the operation for aneurism, the ligature could be removed, and yet the vessel become obliterated, it would be highly advantageous, as there would then be left in the wound no extraneous substance to prevent its union, or promote secondary hemorrhage by extending the sloughing, or ulcerative process too far. It is to be regretted, that success has not attended the repetition of the experiment by others. Mr. Hodgson tried it, but the artery did not become impervious. (See *Experiments A & B. p.* 228, 229, of this gentleman's work.) It appears, however, that an effusion of lymph is an invariable consequence of the operation: the want of union is therefore owing to the opposite sides of the vessel not being retained in a state of contact, so as to allow of their adhesion. (See *Obs. on the Application of the Ligature to Arteries, &c. by Mr. Travers, Medico-Chirurgical Trans. Vol.* 4.)

This gentleman conceived, that if a ligature were applied to an artery, and suffered to remain only a few hours, the adhesion would be sufficient to insure the obliteration of the canal; and he judged, that the removal of the ligature at this period would prevent its chief inconveniences. Under these impressions, he performed several experiments, which proved, that if a ligature be kept six, two, or one hour upon the carotid artery of a horse, and then removed, the adhesion was sufficiently advanced to effect the permanent obliteration of the canal. Mr. A. Cooper appears to have performed one operation for a popliteal aneurism, with a view of ascertaining the efficacy of such a method on the human subject. He completely stopped the flow of blood for thirty-two hours, and then removed the ligature; but, the pulsations of the tumour commenced again. He next applied the ligature forty hours longer, at the end of which time, no pulsation recurred on the ligature being taken away. On the twelfth day, however, a considerable bleeding took place, and it was necessary to take up the vessel anew.

Hitherto, therefore, the suggestion of removing the ligature either immediately, or soon after the operation, has not been productive of any utility in practice. Whether it ever will be an advantage can only be determined by future experience.

Before entering into the consideration of particular aneurisms, there is another circumstance, which every practical surgeon ought to be aware of. I allude to the partial entrance of blood into the aneurismal sac after the artery has been tied at some distance from the tumour. This subject has not been generally explained by surgical writers, and I am of opinion that a modern author has great merit for the manner in which he has noticed it. "When an artery is tied close to an aneurismal sac, the ingress of blood into the latter is in most instances prevented; the coagulum, which it contains, is absorbed, and the membranes, of which the sac is composed, gradually contract until its cavity is permanently obliterated. But, when the artery is tied at a distance from the disease, the ingress of blood into the latter is not altogether prevented; for, the anastomosing branches, which open into the trunk, below the seat of the ligature, convey a stream, which passes through the aneurism. The impulse of this current, however, is so trifling, that the enlargement of the sac not only ceases, but the deposition of coagulum in it increases, in consequence of the languid state of the circulation. The coagulum accumulates, until the cavity of the sac, and the mouth of the artery leading into it, are obliterated, &c. (See *Hodgson on the Diseases of Arteries, p.* 266.)

This fact, which is of great importance, both in a practical and pathological point of view, is proved, (says this gentleman,) 1st, by the occasional recurrence of pulsation in the tumor after the operation; 2dly, by cases in which the cavity of the sac has been exposed, and hemorrhage has been the consequence; and 3dly, by dissection, in which it has been found, that the cavity of the aneurism, as well as that of the artery, from which it originated, was pervious, from the part which was obliterated by the direct operation of the ligature.

For a detail of the facts relative to this interesting point, the reader is referred to Mr. Hodgson's valuable publication. (*P.* 267, *et seq.*)

It is pleasing to reflect, that the most important improvements in the treatment of aneurisms, are the fruit of the industry, talent, and spirit of British surgeons. The only methods of operating which now have any advocates either here, or on the continent, were proposed by Monro and Hunter. In Monro's observations upon the aneurism at the bend of the arm, (see *Edinb. Med. Essays,*) is to be found the first accurate description of the operation, in which the sac is opened; a mode, which is yet very commonly preferred in France. Hunter made the grand improvement of operating, by tying the artery at some distance above the disease, where the vessel is more likely to be sound and capable of uniting, and instead of opening the sac, he left dispersion of the swelling to nature. That Mr. Hunter's claim to an original meritorious proposal is not diminished by any thing, which Anel, or Desault had previously done, will be sufficiently obvious in the sequel of this article.

As M. Roux observes: "the Hunterian operation, was first applied to the frequent cases of popliteal aneurism; and then to others, in which the plan of opening the sac was also practicable, such as those of the brachial artery, and the femoral artery in the middle of the thigh. It afterwards led to those bold attempts, in which surgery appears to have reached its utmost limits in operations for aneurismal diseases. The ligature of the external iliac artery for the inguinal aneurism; the ligature of the axillary artery at its origin, or of the subclavian at its termination, for the axillary aneurism; the ligature of the common carotid, between the sternum and the aneurismal swelling, with which this vessel or one of its principal branches, is affected; are so many extensions of the Hunterian method. Or rather, each of these operations is Hunter's method, applied to aneurisms different from those, for which it was originally proposed.

"These last operations, two in particular, the ligature of the external iliac artery, and that of the common carotid, belong to English surgery, cases, for which there was no plan of relief known, except the ineffectual use of topical applications. If credit is to be given to a fact, which I heard of during my stay in England, and which I find reported in a work on aneurism lately published in London, with such details as seem to confirm its authenticity, (*Treatise on the Diseases of Arteries and Veins*, 1815,) an English surgeon has tied the internal iliac artery, for an aneurism of the ischiatic artery, one of the branches, in which the internal iliac terminates in the pelvis. The scheme of taking up the subclavian as it passes over the first rib, formed (says M. Roux) in the bosom of the French Academy of surgery, the English surgeons have executed, and even gone further. They are disposed to believe, that this artery may be tied within the scaleni muscles, with some probability of success. They even go so far (though I dare hardly mention the thing) as to talk of tying the arteria innominata, the common trunk of the right subclavian and carotid.

"All this implies great confidence in the resources of nature for reestablishing the circulation, after the stoppage of the flow of blood in the largest arteries, which admit of being tied. And, indeed, this confidence is possessed by the English surgeons in the highest degree. They carry it further, than we do." (*Relation d'un Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec l a Chirurgie Françoise*, *p.* 251—253.)

This gentleman has included in his publication some criticisms on the English method of operating for aneurisms. It would hardly be fair play to endeavour to offer a serious refutation of them, because it is his misfortune to be uninformed of the facts and experiments recorded in the inestimable treatise on hemorrhage by the late Dr. Jones. "Still less confident, than we are (says M. Roux) in the treatment by compression, and in the use of topical remedies for the cure of external aneurisms, the English surgeons have immediate recourse to the operation with the ligature. Hunter's method is that which they universally practise. They will not even allow, that there are any cases, in which the operation by opening the sac should be preferred, &c. And it is singular, the very same motive, which would incline us in some cases of aneurisms, properly so called, to adopt the operation of opening the sac, is alleged by the English surgeons as a circumstance in favor of the Hunterian method. Let us suppose (continues M. Roux) an aneurism so formed, that near the centre of the tumour, or rather, near the opening, by which the artery communicates with the swelling, are situated the orifices of the collateral arteries, which would be useful for the reestablishment of the circulation. Here, it is clear, that, in practising the operation by the Hunterian method, that is to say, in tying the artery above the tumour, the last ramifications are not indeed sacrificed; but the orifices and first branches of these collateral arteries. Let there be, for example, at the upper part of the femoral artery an aneurism, which, though formed originally below the origin of the profunda, now extends above it. Here it is manifest, that, in tying the femoral artery above the swelling, we shall lose the important resource of the profunda for reestablishing the circulation in the lower part of the limb. The desire and hope of saving the profunda would in such a case, make us adopt the operation of opening the sac, in preference to the Hunterian method: and Scarpa himself, so great an advocate for this last mode, Scarpa, who seems only to have composed his work to cry up this method, makes an exception of the case, which I have just been supposing. The English surgeons, on the contrary, would urge the following objection to the operation by opening the sac in this, and other analogous examples. They contend, that the ligatures would be applied too near to the origin of the collateral arteries, which are to receive the blood after the operation. They are prepossessed with the idea, that, when an arterial trunk is tied at a given point, the too great proximity of the principal collateral arteries disposes to subsequent hemorrhage; &c." (*P.* 256, 257.) a circumstance, which M. Roux seems to doubt.

Now, before attempting to reply to these observations, we ought to know what exact distance, M. Roux means, when he speaks of the profunda, or a large collateral artery, originating near the opening by which the aneurism communicates with the main artery. Here he is not at all precise; and were he to tie the femoral artery immediately below the point, where the profunda arises, he would expose his patient to great danger of bleeding. I say this, well aware of the case which he has adduced to prove the contrary. In the example brought forward, he applied several ligatures; (*P.* 260) some of which were the *ligatures d'attente*, or loose ligatures left ready to be tightened in case of need. These were of course higher up, than the ligature, which was tightened. It is therefore impossible, that this last could have been close to the origin of the profunda. There must have been room left for the application of the *ligatures d'attente;* and be it also recollected, that the French still persist in the use of large flat cords, and not small firm round ligatures, which are now found to be most advantageous. (See *Hemorrhage.*) In this part of the dictionary, we shall find, that the nearness of a collateral vessel always impedes the formation of the internal coagulum, which has a material share in the process by which the artery is closed.

In England surgeons now lose few patients, of gangrene of the limb after operations for aneurisms, and this notwithstanding they may sometimes prefer applying a ligature above the profunda to cutting open the aneurismal tumour. I firmly believe, that such matchless success is to be totally ascribed to the perfections in our mode of operating; the choice of a proper kind of ligature; the right plan of applying it; the rejection of the employment of several ligatures at a time; and, above all, to the relinquishment of the formidable proceeding of cutting open the tumor.

With respect to the circumstance of hemorrhage being likely to follow, when the ligature is placed close below a great collateral artery, there cannot be a doubt of the fact. M. Roux, when in London, saw an occurrence of this kind himself, and has published it in his book. It was a case, in which Mr. A. Cooper tied the external iliac artery; but the patient died of hemorrhage a fortnight afterwards, and on opening the body, it was ascertained, that the obturator artery, which usually arises either from the trunk of the internal iliac, or from the epigastric, proceeded from the external iliac, and arose immediately above the point, to which the ligature was applied. (See *Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, &c. P.* 278, 279.)

Brasdor first, and afterwards the celebrated Desault conceived, that, when an aneurism was so situated, that a ligature could not be applied to the artery leading to the swelling, a cure might possibly arise from tying the vessel, on that side of the tumour, which was most remote from the heart. Desault conjectured, that, by this means, the circulation through the sac would be stopped, the blood in it would coagulate, that the circulation would go on by the collateral arteries, and that the tumour would be finally absorbed. These speculations, however, were not found to answer in practice. Deschamps tied the femoral artery below an inguinal aneurism; but the progress of the disease, instead of being checked, seemed to be accelerated by this novel experiment. The operator was obliged, as a last resource, to open the tumour, and try to take up the vessel. In this attempt, the patient lost a large quantity of blood, and died eight hours afterwards. (See *Œuvres Chir. de Desault par Bichat, Tom.* 2, *p.* 563. and *Recueil Périodique de la Societé de Médecine de Paris, Tom.* 5, *No.* 17.)

The operation of tying the artery below the tumor has been of late repeated by Mr. Astley Cooper, not for an aneurism of the femoral artery in the groin, but for an aneurism of the external iliac, where tying the artery above the swelling was impracticable. The femoral artery was therefore tied immediately below Poupart's ligament, between the origins of the epigastric and the profunda. The pulsations of the tumor continued; but, the progress of the disease was checked. After a time, indeed, the swelling decreased, and this in so considerable a manner, that hopes began to be entertained, that perhaps the external iliac artery might soon admit of being tied above the disease. The ligatures came away without any unfavourable occurrence, and when the wound was healed, the patient was sent into the country for the benefit of the change of air. The tumor, however, gave way, an extravasation of blood took place in the abdomen and cellular membrane of the pelvis, and the patient died. Mr. Cooper had no opportunity of seeing the case, and the body could not be opened, so that further particulars were not obtained.

M. Dubois, one of the most eminent surgeons at Paris, conceived, that hemorrhage might sometimes proceed from the circumstance of a ligature making its way too fast through the artery. He thought, also, that the sudden stoppage of the current of blood by a tight ligature might bring on gangrene of the limb, particularly, where the aneurism was not of long standing, so that the collateral branches had not had time to enlarge. Professor Dubois, therefore, proposed a method of *gradually* stopping the flow of blood through the artery, and, by this ingenious imitation of the process of nature, to promote the gradual dilatation of the collateral arteries, and obviate all risk of gangrene in the lower part of the limb. This gentleman put his plan in execution, and two instances of success are recorded. The cases were popliteal aneurisms. A ligature was passed under the artery in the manner of Hunter; its two ends were then put through an instrument, called a serre-nœud, with which the compression was gradually increased. It is stated, that, in one of these cases, the plan made the artery inflame and become impervious, in the course of the first night, so that on the following day the throbbing of the tumor had ceased. (*Richerand, Nosogr. Chir. T.* 4, *P.* 109, *Edit.* 4.) Here, however, it is to be suspected, that the pressure of the apparatus was greater, than was calculated, and that the stoppage of the pulsation was more owing either to this cause, or to the coagulation of the blood, in the sac and adjoining portion of the artery, than to the process of obliteration, which could hardly have been so rapidly accomplished.

In internal aneurisms, and other cases, out of the reach of operative surgery, practitioners have usually been content with prescribing occasional bleedings, debilitating remedies, abstinence, a milk diet, and quietude, &c. As bleeding, however, cannot always be frequently repeated, instead of it, Scarpa says, the hands and feet may be immersed in tepid water, the limb rubbed, and water given internally, with a small quantity of Hoffman's liquor anodynus mineralis. (*Spir. Ætheris. Comp.*) The great difficulty of breathing, adds the same writer, may receive a temporary relief, by applying sinapisms. All pressure on the tumour, when it protrudes externally, should be avoided, as it might increase the compression on the viscera, and would certainly accelerate the fatal bursting of the aneurism.

Digitalis has been given with advantage; but, occasional bleedings, and opium, have been found to produce most relief. In the latter stage, opium can alone be relied on. (*Freer.*)

It must be acknowledged, that practitioners have too commonly abandoned such aneurisms as do not admit of an operation, as inevitably fatal, and, whatever measures have been taken, in cases of this kind, have rather been pursued with a view of palliating the patient's sufferings, than with any hope of effecting a cure. Yet, we shall find, in the ensuing section of this article, that some exceedingly large aneurisms of the aorta itself, have been cured by copious and repeated venesections, and the rigorous adoption of Valsalva's practice. Were the same treatment more generally followed, no doubt, internal aneurisms might seem much more curable than they have usually been regarded.

### OF ANEURISMS OF THE AORTA, AND VALSALVA'S TREATMENT.

This afflicting and fatal disease is by no means unfrequent, and the arch of the aorta is the most common situation of the tumour. Dr. Hunter was of opinion, that the latter circumstance depended on the forcible manner, in which the blood, propelled from the left ventricle of the heart, must be driven against the angle of the curvature of the vessel. The same distinguished physician also thought, that the aneurismal sac was composed of the dilated coats of the artery, which parts nature thickened and studded with ossifications, after the origin of the disease, for the purpose of resisting its increase. Mr. Hodgson also in his late excellent publication declares his decided belief, and adduces facts to prove, that many aneurisms of the aorta are formed by dilatation. Scarpa, however, contends that the generality of aneurisms of the aorta are the consequence of a rupture of the proper coats of this large vessel; and that the cellular sheath of the artery is what becomes distended into the thickened and ossified aneurismal sac. It seems also to be a fact, that, when the coats of the aorta give way in a certain situation (viz. within the pericardium) where they only receive a very slight external membranous covering, this last part is also apt to be ruptured at the same time, so as to bring on a copious effusion of blood in the chest, and sudden death.

We have stated, that Dr. Hunter considered the ossifications of the sac as consequences of the disease; but the celebrated Haller looked upon such scales of bone in the aorta as the very cause of the affection, by rendering the artery inelastic, and incapable of yielding to each pulsation of the heart.

It is very certain, that aneurisms of the aorta are most commonly met with in persons, who are advanced in life, and, it is equally well known, that the aorta of every old subject, whether affected with aneurism, or not, is almost always marked in some place, or another, with ossifications, or, rather, with calcareous concretions. Such productions appear to occasion a decay, or absorption, of the muscular and inner coats of the vessel, so that, at length, the force of the blood makes the artery give way, and this fluid, collecting on the outside of the laceration, or rupture, gradually distends the external sheath of the artery into the aneurismal sac, which itself becomes at last of considerable thickness and studded with ossified specks.

"If any person, who is not prejudiced in favour of the common doctrine, with regard to the nature and proximate cause of this disease (says Scarpa), will examine, not hastily and superficially, but, with care and by dissection, the intimate structure and texture of the aneurism of the aorta, unfolding with particular attention the proper and common coats of this artery, and, in succession, those, which constitute the aneurismal sac, in order to ascertain distinctly the texture and limits of both, he will clearly see, that the aorta, properly speaking, contributes nothing to the formation of the aneurismal sac, and, that, consequently, the sac is merely the cellular membrane, which, in the sound state, covered the artery, or that soft cellular sheath, which the artery received in common with the neighbouring parts. This cellular substance, being raised and compressed by the blood, effused from the corroded or lacerated artery, assumes the form of a circumscribed tumour, covered externally, in common with the artery, by a smooth membrane, such as the pleura in the thorax, and the peritoneum in the abdomen.

"I do not pretend to deny, (continues this accurate anatomist), that, sometimes, in consequence of congenital relaxation of the proper coats of the aorta, at its exit from the heart, a certain degree of yielding of these coats may contribute to the rupture of the aorta at this place, and, by that means, to the formation of an aneurism, which, in this case, is likewise conjoined with a certain degree of preternatural dilatation of the whole tube of the artery. I only deny, that dilatation of this artery precedes and accompanies every aneurism of the aorta, and am unwilling to admit, that, in the formation of this formidable disease, the proper coats of the aorta ever yield so much to distention, as to form the aneurismal sac. With regard to this point, it is a fact worthy of the attention of medical men, and of all those, who wish to investigate this subject, that the root of an aneurism of the aorta, in whatever point of this artery it appears, never includes the whole circumference of the tube of the artery; but, that the root constantly occupies and involves only the one, or the other side of the artery, from which side, the aneurismal sac rises and enlarges, in the form of an appendix, or tuberosity, more or less large and extended, according to the circumstances of the place, or of the period of the disease; while on the contrary, the dilatation of the artery occurs constantly in the whole circumference of the tube, and therefore differs essentially from aneurism." (*Scarpa on the Anatomy, Pathology, and Surgical Treatment of Aneurism, Transl. by Wishart, p. 55, 56.*)

As we have already stated, the sentiment of Scarpa is not adopted by all; and we need not here repeat the facts, which Mr. Hodgson has collected to support a contrary doctrine.

In whatever manner aneurisms of the aorta are formed, there are no diseases, which are more justly dreaded, or which more completely fill the surgeon, as well as the patient, with despair. No affliction, indeed, can be more truly deplorable; for, the sufferings, which are occasioned, hardly ever admit even of palliation, and the instances of recovery are so very few, that no consolatory expectation can be indulged of avoiding the fatal end, to which the disease naturally brings the miserable sufferer.

The existence of aneurisms of the aorta is scarcely ever known with certainty, before they have advanced so far, as to be attended with an external pulsation, and a tumor, that admits of being felt, or even seen. In very thin subjects, the throbbing of the abdominal aorta is sometimes unusually plain through the integuments and viscera, and this has occasionally given rise to the suspicion of an aneurism; a circumstance, which deserves to be remembered by every surgeon, desirous of not pronouncing a wrong opinion. While thoracic aneurisms of the aorta are accompanied with no degree of external swelling, the symptoms are all equivocal, and might depend on a disease of the heart, angina pectoris, and several other affections. Violent and irregular throbbings frequently occur between the fourth and fifth true ribs of the left side; the same irregularity of the pulse prevails as often proceeds from organic affections of the heart; the respiration is exceedingly obstructed; the voice altered; and, in a more advanced period of the malady, the patient is at times almost suffocated. The pressure of the internal swelling on the trachea, bronchia, and lungs, is sufficient to account for this difficulty of breathing. In many instances, the irritation and compression, produced by the tumor, occasion an absorption of the greater part of the lungs, and abscesses and tubercles throughout the portion which remains. Even the function of deglutition suffers interruption in consequence of the pressure made on the œsophagus, which may even be in a state of ulceration. Thus, in an example recently published, we read that "the cavity of the windpipe was nearly obliterated from the pressure of the aneurism; and the extremities of four of its cartilages lay in the œsophagus, having entered that canal, through an ulcer in its coats." (*Transactions of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol. 3, p. 83.*) The way, in which aneurisms of the thoracic aorta prove fatal, is subject to considerable variety. These swellings do not always destroy the patent by hemorrhage; in numerous instances, the magnitude of the disease so impedes respiration, that death seems induced by suffocation, and not a drop of blood is found internally effused. Frequently, (to use the description of Mr. John Bell) before the awful and fatal hemorrhage has had time to occur, the patient perishes of sufferings too great for nature to bear. The aneurismal tumor so fills the chest, so oppresses the lungs, compresses the trachea, and curbs the course of the descending blood, that the system, with a poor circulation of ill-oxydated blood, is quite exhausted. And, thus, though the patient is saved from the most terrible scene of all, he suffers great miseries; he experiences in his chest severe pains, which he compares with the stabbing of knives; terrible palpitations; an awful sense of sinking within him; a sound within his breast, as if of the rushing of waters; a continual sense of his condition; sudden startings during the night; fearful dreams and dangers of suffocation, until, with sleepless nights, miserable thoughts by day, and the gradual decline of an ill-supported system, he grows weak, dropsical, and expires. (See *Anatomy of the Human Body, by John Bell, Vol. 2, Edit. 3, p.* 234, 235.)

The situations, in which aneurisms of the curvature of the aorta burst, are different in different cases. Sometimes the swelling bursts into the cavity of the chest, or that of the pericardium, and the patient drops suddenly down. In other examples, the blood is effused into the trachea, or bronchia, and the patient, after violent coughings and ejections of blood from the mouth, expires. In certain cases, the swelling beats its way through the ribs, destroys the vertebræ, and injures the spinal marrow, so that the patient suffers a species of death, somewhat less violent and sudden. But, although aneurisms in the chest do sometimes present at the back, a circumstance, that depends on the particular situation of the disease, (see *Pelletan's Clinique Chirurgicale, Tom* 1, *Obs.* 7, *p.* 84) they more commonly rise towards the upper part of the breast, where a throbbing tumour occurs, which has caused an absorption of the opposing parts of the ribs and sternum; and sometimes dislocated the clavicles. The swelling now pulsates in an alarming way. The blood is only retained by a thin covering of livid skin, which is becoming thinner and thinner. At length, a point of the tumour puts on a more conical, thin, and inflamed appearance than the rest; a slough is formed, and, on this becoming loose, the patient is instantaneously carried off by a sudden gush of blood.

A singular case of aneurism of the aorta is related by Dr. C. W. Wells. The disease, being unattended with any external swelling, it seems, was not known with certainty during the patient's life-time.

The following is an abstract of the symptoms, and particulars of the case. Mr. A. B. a gentleman, thirty-five years of age, and temperate in his habits, became affected in 1789 with symptoms, which were thought to denote the approach of pulmonary consumption. These, however, after some time, entirely disappeared In 1798, he was attacked with a slight hemiplegia, from which he also recovered, with the exception of an inconsiderable sense of coldness in the foot, which had been paralytic. In March 1804, he complained of being frequently troubled with a noise in his ears, flatulence in his bowels, and pains in his hands and feet, sometimes attended with slight swellings in the same parts. From one, or more of these symptoms, he was never afterwards quite free; but, he did not complain of any unusual feelings in his chest. August 11, 1807, he fatigued himself considerably with walking; ate rather a hearty dinner; and, having refreshed himself with some sleep afterwards, he played about with his children. While thus amusing himself, he was suddenly seized, between eight and nine o'clock, with great oppression in his chest. He soon afterwards became sick, and, in the matter thrown up, some streaks of blood were observed. He now went to bed; but, though the weather was warm, and he was covered with bed-clothes, his skin felt cold to the attendants At midnight, he laboured under a constant cough, and expectorated mucus tinged with blood. His body was moistened with a cold sweat, and his pulse was extremely feeble; sometimes, it was scarcely perceptible. About five in the morning, his pulse was feeble and irregular; his breathing difficult, his skin pale, and cold, and covered with a clammy sweat. He frequently tossed, and writhed his body, as if he was suffering great pain or uneasiness. The mental faculties, however, seemed unimpaired. Shortly, afterwards, he expired having complained just before his death, of much heat in his chest, and thrown off the bed-clothes.

The most remarkable circumstance found on opening the body, is thus recorded: "The ascending aorta was distended to about the size of a large orange. The tumor adhered to the pulmonary artery, just before its division into the right and left branches Within the circumference of this adhesion, there was a narrow hole, by means of which a communication was formed between the two arteries."

Dr. Wells concludes with observing, that, though such a disease might easily have been imagined, he has found no instance of it in books, and that it has not been observed by any of the surgeons, or anatomists in London. He supposes, that the communication, between the aorta and pulmonary artery, took place on the evening before the patient's death, when the oppression of the chest was first felt; and that, in consequence of the superior strength of the left side of the heart, a part of the blood, which was thrown into the aorta, must have been forced into the pulmonary artery, from which circumstance, he conjectures most of the symptoms originated. (*Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol.* 3, *p.* 85.)

The bursting of an aneurism of the aorta into the pulmonary artery is then another possible mode, in which the disease may prove fatal.

It is well worthy of notice, that aneurisms of the arch of the aorta may occasion a tumor, so much like that of a subclavian aneurism, as to be in danger of being mistaken for the latter disease. An example of this kind is related by Mr. Allan Burns: "a case," says he, "on which several of the most distinguished practitioners in Edinburgh, and almost every surgeon in Glasgow were consulted. The nature of the disease appeared to be so decided, and its situation in the subclavian artery so clear, that, on that subject, there was no difference of opinion. Some were, however, of opinion, that an operation might be performed, while others were fully convinced, that the case was hopeless. For myself, I must confess, that I was firmly persuaded, that in the early stage of the disease, an operation might have been beneficial," &c. (*Surgical Anatomy of the Head and Neck, p.* 30.) After death, the vessel, which was supposed to have been most materially affected, was found perfectly healthy. (*P.* 39.)

After detailing all the particulars of this interesting case, Mr. A. Burns observes, that, "it corroborates Mr. Astley Cooper's remark, that aneurism of the aorta may assume the appearance of being seated in one of the arteries of the neck; an inference, drawn from the examination of a case, which came under his own observation, and of which he had the goodness to transmit a short history to me, along with a sketch, illustrative of the position of the tumor. In one case, the aneurism was attached to the right side of the aortic arch, and involved a part of the arteria innominata; in Mr. Cooper's, the tumor arose from the left side of the arch, from between the roots of the left subclavian, and carotid arteries. It formed a florence-flask-like cyst, the bulbous end of which projected at the root of the neck, from behind the sternum, and so nearly resembled aneurism of the root of the carotid artery, that the practitioner, who consulted Mr. Cooper, actually mistook the disease for carotid aneurism." (*Allan Burns, Op. cit. p.* 41.)

The preceding statement has received full confirmation from the observations of an intelligent writer. "I have seen (says Mr. Hodgson) several cases of aneurism, arising from the superior part of the arch of the aorta, which protruded above the sternum and clavicles, and, in one instance, the space between the tumor and the sternum was so considerable, that it was proposed to tie the carotid artery for an aneurism, which dissection proved to arise from the origin of the arteria innominata and from the arch of the aorta." (*Treatise on the Diseases of Arteries and Veins, p.* 90.)

As we have already noticed, aneurisms of the aorta are most frequent at its curvature; but, they are also met with on the other portion of this vessel in the thorax, and likewise on that part of it, which is below the diaphragm. In subjects, predisposed to aneurisms, such swellings are frequently seen affecting various parts of the aorta at the same time.

When the disease occurs in the abdominal aorta, a preternatural pulsation generally becomes perceptible at some point of the parietes of this part of the body. The pressure of the tumour interferes with the functions of the viscera; the breathing is rendered difficult by the swelling resisting the descent of the diaphragm; the patient suffers at times excruciating internal pains; sometimes he is affected with costiveness; sometimes, with diarrhæa; and, not unfrequently with incontinence of the urine and feces. At length, an immense external swelling is formed, which pulsates alarmingly, and, if the patient survives long enough, destroys him by a sudden external, or internal effusion of blood.

Aneurisms, within the thorax and abdomen, being entirely out of the reach of operative surgery, have been too commonly abandoned as unavoidably fatal, and when any thing has been done in such cases, it has generally been only with a view of palliation. Moderating the force of the circulation by bleedings and low diet, avoiding every thing that has the least tendency to heat the body, or quicken the motion of the blood, keeping the bowels well open with laxative medicines, and lessening pain with opiates, have been the means usually employed. Of late years, also, the digitalis, which has a pecular power of diminishing the action of the sanguiferous system and impetus of the blood, has been prescribed, with every appearance of benefit.

It was the opinion of the celebrated Valsalva, that the utility of a lowering plan of treatment might do more than merely retard the death of aneurismal patients. It was his belief, that the method might entirely cure such aneurisms as had not already made too much progress, and he put it into practice with such rigour and perseverance, that the treatment became considered as particularly his own. The plan, alluded to, is not described in his writings; but, was published in the first volume of the Commentaries of the Academy of Bologna, by Albertini, one of his fellow students; and several persons, who had learnt this method of Valsalva, afterwards imparted it to others. Thus, as Morgagni was passing through Bologna, in 1728, Stancazi, a physician of that place, is said to have informed him of Valsalva's practice.

After taking away a good deal of blood by venesection, Valsalva used next to diminish the quantity of food gradually, till the patient at length was allowed only half a pint of soup in the morning, and a quarter of a pint in the evening, and a very small quantity of water, medicated with mucilage of quinces, or with the lapis osteocolla. When the patient had been so reduced, as to be incapable of getting out of his bed, Valsalva used to give him more nourishment till this extreme debility was removed. Valsalva was sure, that some aneurisms, thus treated, had got well, because every symptom disappeared, and his conviction was verified by an opportunity, which he had of dissecting the body of a person that had been cured of this disease, and afterwards died of another affection; for, the artery, which had been dilated, was found contracted and in some degree callous.

Morgagni relates, that this method of treating aneurisms, is somewhat like the plan, which Bernard Gengha tried with success, as well as Lancisi, and he refers us to the 24th chapter of the 2nd vol. of the Anatomy of the one, and to lib. 2, cap. 4, of the Treatise on the Heart and Aneurisms, of the other. But, Sabatier tells us, that, in consequence of this instruction, he examined both these works, without finding any thing on the subject. However this may be, we are informed by the latter, that he has seen the good effects of the practice in an officer, who had an alarming aneurism in front of the humeral extremity of the clavicle, in consequence of a sword wound in the axilla. The patient, after having been bled several times, was confined to his bed, and kept to an extremely low diet. He was allowed, as drink, only a very acid kind of lemonade. He took pills containing alum, and the swelling was covered with a bag full of tan mill dust, which was every now and then well wet with port wine. By a perseverance in this treatment, the swelling was reduced to a smallish hard tubercle, having no pulsation, and a perfect cure ensued. (See *Sabatier's Médecine Opératoire, Tom. 3, p.* 170—172.)

A French surgeon named Guérin, has written in favour of the efficacy of applying ice water, or pounded ice, to aneurismal swellings; a plan, which he represents, as being often of itself sufficient to effect a cure. This topical employment of cold applications may be rationally and conveniently adopted in conjunction with Valsalva's practice.

The most interesting and convincing facts, in proof of the efficacy of this mode of treatment, have been lately published at Paris by M. Pelletan. Indeed, upon the whole, I have no hesitation in saying, that I have never read any modern collection of surgical cases, which have appeared to me more valuable, than those which compose the Clinique Chirurgicale of this experienced writer. The following extract from a well written critique on this work will serve to convey to the reader some idea of the important information contained in the memoir on internal aneurisms. "The intent in the treatment is to reduce the patient gradually to as extreme a degree of weakness, as is possible, without immediately endangering life. It is done by absolute rest, a rigorous diet, and bleeding; to these means, M. Pelletan adds the external application of ice, or cold and astringent washes, &c. He has here detailed many cases from his own practice, of partial, or complete success, which cannot be too generally known, as they may be the means of creating in some, and of confirming in others, a good opinion of the only method of treatment which has been found at all efficacious in a dreadful and not unfrequent organic disease.

"Of the cases here recorded, some appear to have been cured; in others, the treatment had marked good effects. In extreme cases, at best, it afforded but partial and temporal relief. We can notice but a few of these cases, which are, in every respect, highly interesting. In one, a robust man, an aneurism at the root of the aorta, with a pulsating tumour of the size of an egg, projecting between the ribs, (the edges of which were already partly absorbed) was reduced, so as to recede within the ribs in the course of eight days. At the end of this time, the patient refused to submit any longer. The tumour did not appear again for nearly a year, although he returned to very drunken and irregular habits. He died in about two years and a half, with the tumour again appearing, and much increased in volume. The aneurismal sac communicated with the aorta by a smooth and round opening, opposite to one of the sigmoid valves. There can be no doubt of the efficacy of the treatment in this case; and it is highly probable, that his health and his life might have been long preserved, but for his own indiscretion. In a case somewhat similar, but not so far advanced, the patient appears to have been cured. There was a swelling on the right side of the breast, about six inches in circumference, with a very strong beating. The pulsation was accompanied by a pain, which stretched towards the scapula and the occiput. It was evident, that the disease was an aneurism of the great arch of the aorta. The patient was a crier, of a strong frame, who was accustomed to drink freely. In the four first days, he was bled eight times, drawing three dishes, "palettes" in the morning, and two in the evening. On the fifth, the pains and the beating were much lessened, but the pulse was still full. He was again bled once. The pulse was in a favourable state, as to strength, till the seventh day, when it again rose, and the man was twice bled.

During this time, the man was kept to a most rigorous diet. A cold poultice of linseed and vinegar was placed on the tumour, and renewed when it became warm. At the end of eight days, the good effects of this plan were very evident, the pain and the pulsation were gone. The patient, though weak, was in health and tranquil. He was now allowed more food by degrees. At the end of four weeks from the commencement of the treatment, he left the Hôtel Dieu well. He afterwards led a sober life, became fatter than before, without any vestige of disease, except a slight and deep pulsation at the part, in which the aorta may always be felt beating in its natural state. He died, two or three years after, of another complaint. His death was not known, and the body was not examined. (See *London Med. Review, Vol. 5, p.* 123.)

M. Pelletan also cured by similar treatment a large axillary aneurism, which was regarded as beyond the reach of operative surgery. On the thirteenth day, the patient was reduced to a degree of weakness, which alarmed many of the observers. From that time, all pulsation in the tumour ceased. The contents were gradually absorbed; and the patient returned to his former laborious life with his arm as strong as ever. The pulse at the wrist was lost, in consequence of the obliteration of the axillary artery, and the limb only receiving blood through the branches of the subclavian artery. *Il y a beaucoup d'exemples, d'aneurismes guéris spontanément et sans le secours de l'art;* (says Pelletan) *mais on ne peut leur comparer le cas que nous venons de décrire; l'état extrême de la maladie, l'energie des moyens employés, et l'effet immédiat et succesif qui en est résulté, prouvent assez que le succès a été dû tout entier à l'art.*" (*Clinique Chirurgicale, Tom.* 1, *p.* 80.)

In this work, we find not less than three cases, in which aneurism of the aorta is stated to have been effectually cured. One instance was greatly relieved; but, the disease returned, the next year, in consequence of the patient's intemperate mode of life. In another example, an aneurism at the origin of the aorta was cured; but, the disease recurred in another part of that vessel further from the heart. Even such cases, as proved incurable, to the number of fourteen, all received various degrees of palliation from the treatment adopted.

In a modern work of great merit, several other instances are adduced, in which the utility and efficacy of a debilitating plan of treatment are illustrated. (See *Hodgson's Treatise on the Diseases of Arteries, p.* 146—147, *&c. &c.*) In the same publication, as I have previously explained, there are several interesting facts, which tend to prove, that when the aneurism of the aorta is lessened, or cured, this great vessel itself may remain pervious. The progress of the disease is stopped by the blood coagulating in the sac, and closing the communication between the cavity of the aneurism, and that of the artery.

It must be confessed, in regard to Valsalva's mode of treatment, that some experienced men do not place confidence in it. Boyer declares himself against it, as not being really efficacious; and he states, that it has been lately tried twice in the Hôtel Dieu of Paris. The first trial was made on a patient with an axillary aneurism, which could not be operated upon on account of its situation; the second on a woman, who had an aneurism of the abdominal aorta. In both cases the tumor was large, and its parietes reduced to the cellular coat, and the surrounding cellular substance. In these two aneurisms, the progress of the swelling was much more rapid, and its rupture happened precisely at the moment, when the treatment had been pushed to the utmost, and there ought to have been the greatest hope. (*Boyer's Traité des Maladies Chir. T.* 2, *p.* 121.)

I shall now proceed more particularly to the consideration of aneurisms, which may be cured by a surgical operation, and, here we shall be fully satisfied, that, "*l'art de guérir ne triomphe jamais plus heureusement que lorsqu'il peut employer la medecine efficace, c'est à dire, les moyens chirurgicaux ou opératoires.*" (*Clinique Chirurgicale, Tom.* 1, *p.* 110.)

### OF THE POPLITEAL ANEURISM, AND OPERATION FOR ITS CURE.

The practice of tying arteries, wounded either by accident or in the performance of surgical operations, and even the plan of tying the humeral artery for the cure of the aneurism at the bend of the arm, were known long before the operation for the relief of the popliteal aneurism was attempted. The considerable size of the femoral artery; its deep situation, the urgent symptoms of the disease, and ignorance of the resources of nature for transmitting blood into the limb, after the ligature of the vessel, are the circumstances, which appear to Pelletan to have deterred former surgeons from this operation. Valsalva, indeed, had treated popliteal aneurisms on the debilitating method, and has adduced one or two equivocal proofs of its success.

In Pelletan's first memoir on aneurism, and in the third vol. of Sabatier's Médecine Opératoire, as I have already stated, are two cases of axillary aneurisms, which were cured by Valsalva's treatment. But, encouraging as such examples may be, experience is not yet sufficiently favourable to this practice to allow it to bear a comparison, in point of efficacy, with the surgical operation, or to justify the general rejection of this last more certain means of cure. As Pelletan admits, Valsalva's treatment is extremely severe; the event of it is doubtful; and should it not be found to answer, it is questionable, whether the patient would be left in a condition to bear the operation, for the success of which it seems necessary, that a certain strength of vascular action should exist, in order that the blood may be freely transmitted through such arterial branches, as are to supply the places of the main trunk, after this last has been tied.

The time, therefore, has not yet arrived, when surgical operations for the relief of aneurisms should be relinquished. (*Pelletan, Clinique Chirurgicale, Tom.* 1. *p.* 114, 115.)

The cure of popliteal aneurisms by means of compression is occasionally effected; but, it happens too seldom to claim a great deal of confidence, or to lessen in any material degree the utility and importance of operative surgery in this part of practice. Pelletan records the cure of one popliteal aneurism by compression and absolute repose, during eleven months (*Tom.* 1, *p.* 115), Boyer also relates two instances (*Traité des Mal. Chir. p.* 204, 205, *T.* 2), and other examples might be cited, were it necessary.

Aneurisms in general, and, among them, the popliteal case, are all attended with some little chance of a spontaneous cure; yet, this desirable event is too uncommon to be a judicious reason for postponing the operation, especially, as it is the usual course of the disease to continue to increase; while the cure in the early stage may be more speedily accomplished, and the experience of modern operators leaves no room for apprehending, that the anastomoses will not suffice for the due nourishment of the leg, and consequently, proves, that waiting beyond a certain time for the enlargement of the collateral vessels to take place, is altogether an unnecessary and ineligible method. Popliteal aneurisms, as well as other external tumours of the same nature, stand the best chance of a spontaneous cure, when any cause induces a general, violent, and deep inflammation all over the swelling; for, then the communication between the sac and artery, may possibly become closed with coagulating lymph, and the pulsation of the tumour be suddenly and permanently stopped. If, in this state, the disease sloughs, and the patient's constitution holds out, the coagulated blood in the sac and the sloughs, are gradually detached, leaving a deep ulcer, which ultimately heals. An example, in which a popliteal aneurism seems to have been cured by such a process, is related in the *Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol.* 2, *p.* 268.

After what has been stated, it is almost unnecessary to say, that, in former times, when all hopes of curing a popliteal aneurism by Valsalva's method, by compression, or a natural process, were at an end, amputation of the limb was considered as the sole and necessary means of saving the patient's life. In modern times, a great and beneficial change of opinion has taken place upon this subject, and not only may the patient's life be in general saved, but his limb also, and this without any operation, that can be compared with amputation, in regard to severity.

It is alleged, that Teislere, Molinelli, Guattani, Mazotti, and some other celebrated Italian surgeons, were the first, who ventured to tie the popliteal artery for the cure of aneurism. The path, as Pelletan remarks, had been pointed out to them by Winslow and Haller, whose valuable descriptions and plates of the arterial anastomoses about the knee joint, shewed by what means the lower part of the limb would be nourished, after a ligature was made on the principal arterial trunk. For almost thirty years, however, the practice of tying the popliteal artery was confined to the Italian surgeons. Pelletan believes, that he was the first, who attempted such an operation at Paris nearly thirty years ago, (alluding to about the year 1780, the Clinique Chirurgicale being dated 1810.)

However, this operation of opening the tumour and tying the popliteal artery itself, was a severe and often a fatal proceeding, and does not admit of being compared with the Hunterian operation, in point either of simplicity, safety, or success, as I shall explain, after a few particulars relating to the popliteal aneurism have been detailed.

On whatever side of the artery the tumour is produced, it can be plainly felt in the hollow between the hamstrings, and its nature is as easily ascertained by the pulsation in every part of the tumour. Though the disease may, perhaps, not occur in the popliteal artery so often as in the aorta itself, yet, it certainly is seen more frequently in the former vessel, than any other branch, which the aorta sends off. As Sir E. Home has observed, this circumstance has never been satisfactorily explained, and, what is rather curious, in many recent instances of this disease, the patients have been coachmen and postillions. Morgagni found aneurisms of the aorta most frequent in guides, post-boys, and other persons, who sit almost continually on horseback. This he imputes to the concussion and agitation, to which they are exposed.

When we contemplate the effects of various postures of the leg and thigh on the popliteal artery, and the obstruction, which the circulation in it must experience, when the knee is in a state of flexion, we perceive an assignable cause, why this artery should be so often diseased. This account is, in some degree, strengthened by aneurisms of the aorta itself, occurring more frequently at its curvature, than any other part. *(Home in Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol.* 1.)

The popliteal aneurism was generally supposed to arise from a weakness in the coats of the artery, independently of disease. If this were true, we might reasonably conclude, that, except at the dilated part, the vessel would be sound. Then the old practice of opening the sac, tying the artery above and below it, and leaving the bag to suppurate and heal up, would naturally present itself. Mr. Hunter finding, that the arterial coats were altered in structure higher up, than the tumour, and that the artery, immediately above the sac, seldom united when tied; but, that, when the ligature came away, the bleeding destroyed the patient; concluded, that some disease affected the coats of the vessel, before the actual occurrence of the aneurism. Dissatisfied with Haller's experiments on frogs, shewing that weakness alone could give rise to aneurism, he tried what would happen in a quadruped, whose vessels were very similar in structure to the human. Having denuded above an inch of the carotid artery of a dog, and removed its external coat, he dissected off the other coats, layer after layer, till what remained was so thin, that the blood could be seen through it. In about three weeks, the dog was killed, when the wound was found closed over the artery, which was neither increased, nor diminished in size.

It being conjectured, that aneurism was, perhaps, prevented, by the parts being immediately laid down on the weakened portion of the artery, Sir E. Home stripped off the outer layers of the femoral artery of a dog, placed lint over the exposed part of the vessel to keep it from uniting to the sides of the wound, and, in six weeks, killed the animal, and injected the artery, which was neither enlarged, nor diminished, and its coats had regained their natural thickness and appearance.

These experiments strengthened Mr. Hunter's belief, that aneurismal arteries are diseased; that the morbid affection frequently extends a good way from the sac along the vessels; and that the cause of failure in the old operation, arose from tying a diseased artery, which was incapable of uniting, before the separation of the ligature.

Mr. Hunter's reflections led him to propose taking up the artery in the anterior part of the thigh, at some distance from the diseased portion, so as to diminish the risk of hemorrhage, and be enabled to get at the vessel again, in case it should bleed.

The flux of blood into the sac being stopped, he concluded, the sac and its contents would be absorbed, and the tumour gradually disappear, so as to render any opening of the sac unnecessary.

The first operation of this kind, ever done, was performed on a coachman, by Mr. Hunter, in St. George's Hospital, December, 1785. An incision was made on the anterior and inner part of the thigh, rather below its middle, which wound was continued obliquely across the inner edge of the sartorine muscle, and made large, in order to facilitate doing whatever might be necessary. The fascia, covering the artery, was then laid bare, for about three inches, after which the vessel itself could be plainly felt. A cut, about an inch long, was then made through this fascia, along the side of the artery, and the fascia dissected off. Thus the vessel was exposed. Having disengaged it from its connexions with the knife and a thin spatula, a double ligature was put under it, by means of an eye probe. The doubled ligature was then cut, so as to make two separate ones. The artery was now tied with both these ligatures, but, *so slightly as only to compress the sides together*. Two additional ligatures were similarly applied a little lower, with a view of compressing some length of artery, so as to make amends for the want of tightness, as it was wished to avoid great pressure on any one part of the vessel. The ligatures were left hanging out of the wound, which was closed with sticking plaster. On the second day, the aneurism had lost one-third of its size, and, on the fourth, the wound was every where healed, except where the ligatures were situated. On the ninth, there was a considerable discharge of blood from the apertures of the ligatures, but it ceased on applying a tourniquet, and did not recur. On the fifteenth day, after the operation, some of the ligatures came away, followed by a small quantity of matter, and about the latter end of January, 1786, the man went out of the hospital, the tumour having become still less. In the course of the spring, some abscesses in the vicinity of the cicatrix followed, and some pieces of ligature were discharged, from time to time. In the beginning of July, a piece of ligature, about one inch long, came away, after which the swelling went off entirely, and the man left the hospital again on the 8th perfectly well, there being no appearance of swelling in the ham.

This subject died of a fever in March, 1787, and, on dissection, the femoral artery was found impervious from the giving off of the arteria profunda down to the place of the ligature, and an ossification had taken place for an inch and a half along the course of this part of the vessel. Below this portion, the vessel was pervious, till just before it came to the aneurismal sac, where it was again closed. What remained of the sac was somewhat larger than a hen's egg, and it had no remains of the lower opening into the popliteal artery. The rest of the particulars of this dissection are very interesting. *(See Med. and Chir. Trans. Vol. 1. p. 153.)*

This celebrated case led to the knowledge, that simply taking off the force of the circulation is sufficient to cure an aneurism, the tumour being then taken away by absorption.

To confirm the fact, Sir E. Home relates a case of femoral aneurism, which got well without an operation, but, on the same principle. A trial of pressure had been made, without avail. The tumour became very large, and such inflammation took place in the sac and integuments, that mortification seemed impending. In this state, no pulsation could be felt in the tumour, or the artery above it. A coagulum, which we know always occurs in an artery previously to mortification, seemingly to prevent bleeding, probably formed in this instance, and kept the blood from entering the sac. *(Home.)*

Mr. Hunter's second operation was on a trooper. Instead of using several ligatures, which were found hurtful, he tied the artery and vein with a single strong one; but, unluckily, made the experiment of dressing the wound from the bottom, instead of uniting it at once: the event was, the man lost a good deal of blood, and died.

After this, Mr. Hunter's practice was to tie the artery alone with one strong ligature, and unite the wound as speedily as possible.

Since the time of Hunter, several innovations, and some considerable improvements in the mode of operating have been proposed.

The peculiarity in Mr. Abernethy's first operation consisted in applying two ligatures round the artery, close to where it was surrounded with its natural connexions. For this purpose he passed two common sized ligatures beneath the femoral vessels, and having shifted one upwards, the other downwards, as far as these vessels were detached, he tied both the ligatures firmly.

The event of this case was successful. An uneasy sensation of tightness, however, extending from the wound down to the knee, and continuing for many days after the operation, made Mr. Abernethy determine, in any future case, to divide the artery between the two ligatures, so as to leave it quite lax.

Mr. Abernethy next relates a case of popliteal aneurism, for which Sir Charles Blicke operated, with the innovation of dividing the artery between the ligatures. The man did not experience the above kind of uneasiness; and no hemorrhage ensued when the ligatures came away, although there was reason to think, that the whole arterial system had a tendency to aneurism, as there was also another tumour of this kind in the opposite thigh.

Mr. Abernethy has referred bleeding, after operations for aneurisms, to two causes; viz. 1st, the inflammation and ulceration of the artery; 2dly, the want of union between the sides of the vessel. When an artery is laid bare, and detached from its natural connexions, and the middle of such detached portion tied with a single ligature, as was Mr. Hunter's practice, it is observed by Mr. Abernethy, that the vessel, so circumstanced, must necessarily inflame, and be very likely to ulcerate. The occurrence of bleeding led to a practice, which this gentleman justly censures, viz. applying a second ligature above the first, and leaving it loose, but ready to be tightened, in case of hemorrhage. As the second ligature, however, must keep a certain portion of the artery separated from the surrounding parts, and must, as an extraneous substance, irritate the inflamed vessel, it must make its ulceration more apt to follow. For the same reason, Mr. Abernethy thinks pieces of wood, cork, &c. hurtful, and when employed with a view of hindering the ligature from cutting completely through the artery, their interposition is not necessary, as such an accident scarcely ever occurs, and, since they would prevent the ligature from dividing the inner and muscular coat, (see *Hemorrhage*) they would tend to prevent the adhesion of the opposite sides of the vessel to each other.

When the artery is tied in Mr. Abernethy's manner, and is divided in the space between the ligatures, it becomes quite lax, possesses its natural attachments, and is, as nearly as possible, in the same circumstances as the femoral artery is, when tied on the surface of a stump. (See *Surg. and Physiol. Essays by J. Abernethy.*)

It appears that the preceding mode of practice is not altogether original, but only a revival of what was recommended by Ætius, Tenon, and several other surgeons. (*Serm.* 4 *Tetr.* 4, *cap.* 10, and *Pelletan's Clinique Chir. T.* 1, *p.* 192.) Recent experience (says Mr. Hodgson) has proved the success which attends its employment; and secondary hemorrhage from an artery, which has been tied in this manner, is, I believe, not recorded as having taken place in any of the numerous instances, in which the practice has been adopted in this country. Scarpa, however, alludes to two instances, in which it happened. (*Treatise on Aneurism, Trans. p.* 283.) The frequent occurrence of accidents after the introduction of Mr. Hunter's operation, may be ascribed to more probable causes, than the condition of an undivided artery, upon which a ligature has been applied. The employment of numerous ligatures gradually tightened, or the introduction of extraneous bodies into the wound, are sufficient to produce ulceration of the artery: such practices were adopted in most of the cases, in which secondary hemorrhage took place. An artery tied in two places, and divided in the interspace, cannot be regarded as placed exactly in the same condition, as an artery tied in amputation. In the latter case, the retraction of the vessel corresponds with that of the surrounding parts, which are divided at the same instant, and therefore its relative connexions stand as before the operation. But, in the operation for aneurism, the retraction of the artery takes place, without being attended with a corresponding retraction of its connexions. How far the retraction of the artery is beneficial, or injurious, is by no means evident, and the advantages arising from it may in most situations be obtained, without dividing the vessel, by placing the limb in a bent position. One important object, however, is gained by the division of the artery; namely, that it is generally in that case tied close to its connexions; and it is very evident how liable the application of the ligature in the middle of a denuded extent of the vessel must be to produce ulceration or sloughing of its coats. The same object, however, will be gained by tying the undivided artery close to its connexions at the end nearest to the heart; and the existence of a single ligature at the bottom of the wound will be less liable to give rise to suppuration and the formation of sinuses, than the employment of two. When an artery is divided, the portions situated beyond the ligatures, must slough, and prove an additional cause of suppuration in the wound. Experience has amply proved the safety of employing a single ligature, and it is at present used by many of the most experienced operators in this country. (See *Hodgson's Treatise on the Diseases of Arteries, &c. p.* 221, &c.)

The latter is the practice, to which I have for some time past given the preference in operations on the femoral artery. In the year 1814, I was called upon in Holland to tie this vessel in the middle of the thigh, in a case in which the popliteal artery gave way ten days after the passage of a musket ball through the ham. I employed only one smallish ligature, which was applied close to where the artery lay amongst its natural connexions at the upper part of the incision. The hemorrhage was effectually stopped, and the wound healed in the most favourable manner.

When the incision in the integuments and fascia is made above the middle of the thigh, (as a modern surgeon of eminence remarks) the artery should be sought for on the inside of the sartorius muscle; but, when the outer wound is made lower down, the vessel will be found on the external side of this muscle. Should the sartorius happen to be exactly over the artery, he asserts, that it may be cut through without any ill consequences. (*Boyer's Traité des Mal. Chir. T.* 2, *p.* 145.) I shall not presume, however, to second this last piece of advice, because, though it may have been done by Desault, it appears to me, that the artery can always be got at very well without the proceeding here recommended.

Notwithstanding Scarpa has excelled other writers so much, in his description of the anatomy and formation of aneurisms, his practice in regard to the operation, is certainly far inferior to Mr. Abernethy's, and that of practitioners in general in this country. His interposing a cylindrical roll of linen, between the artery and knot of the ligature, and his not bringing the sides of the wound together immediately after the operation, are particularly objectionable parts of his method.

There is one excellence, however, in

Scarpa's mode of operating, which I think will soon obtain the universal approbation of the surgical profession; he prefers making the incision in the upper third of the thigh, or a little higher than the place where Mr. Hunter used to make the wound. His reason for this, is to avoid the necessity of removing the sartorius muscle too much from its position, or of turning it back, to bring the artery into view, so as to be tied. I have seen the best operators embarrassed, by having the sartorius muscle immediately in their way after the first incision, and as the vessel is more superficial a little higher up, the place is further from the diseased part of the artery, and there is no hazard of the anastomoses failing to keep up the circulation; this part of Scarpa's practice is highly deserving of imitation.

"The part of the limb (observes Mr. Hodgson), in which the femoral artery can be tied with the greatest facility, is between four and five inches below Poupart's ligament. The profunda generally arises from the femoral artery an inch and a half, or an inch and three quarters, below Poupart's ligament; it very rarely arises so low as two inches. If, therefore, the ligature be applied to the femoral artery at the distance of four or five inches below Poupart's ligament, the surgeon will not be embarrassed by meeting with the profunda during the operation, and the chance of causing secondary hemorrhage, by tying the artery close to the origin of this vessel, will be obviated." (*See Hodgson's Treatise on the Diseases of Arteries, &c. p.* 434.).

It will in no manner diminish the merit of those men, who have successfully laboured to improve the present branch of the practice of surgery, to state, that the most ancient surgeons seem to have known and practised some of the chief things, upon which the superiority of the plan now adopted appears principally to depend. Such methods having quite sunk into oblivion, and John Hunter not being one who pried into old works, his innovations claim all the honour due to the strictest originality. It is a fact, worthy of notice, that the Greeks were acquainted with the practice, lately recommended, of tying and dividing the trunk of the artery high above the tumour, as will appear from the following extract: *Ætii.* 4. *Serm. Tetr.* 4. *cap.* 10.) *At vero quod in cubiti cavitate fit aneurisma, hoc modo per chirurgiam aggredimur: primum arteria supernè ab ala ad cubitum per internam brachii parte simplicem sectionem, tribus, aut quatuor digitis infra alam, per longitudinem facimus, ubi maxime ad tactum arteria occurrit: atque ea paulatim denudata, deinceps incumbentia corpuscula sensim excoriamus ac separamus, et ipsam arteriam cæco uncino attractam duobus fili vinculis probe adstringimus, mediamque inter duo vincula dissecamus; et sectionem polline thuris explemus, ac linamentis inditis congruas deligationes adhibemus.* Afterwards we are directed to open the aneurismal tumour at the bend of the elbow, and when the blood has been evacuated, to tie the artery twice, and divide it again. If the ancients had only omitted the latter part of their operation, they would absolutely have left nothing to be discovered by the moderns. What a striking example of the bold manner in which our forefathers have acted, without being guided by the lights of anatomy and physiology! But there are two or three passages in Galen, Celsus, and Hippocrates, from which we may suspect, that even Ætius himself was not the inventor of this operation, &c. See also *Paul. Ægin. lib.* 6. *cap.* 37. (*Rees's Cyclopedia, Art. Aneurism.*)

The French surgeons of the present day are exceedingly jealous about the improvements, which British practitioners have been the means of introducing into this branch of surgery. Pelletan declares, that, with regard to dividing the artery between the ligatures, his countryman M. Tenon, used to advise this practice forty years ago, (*Clinique Chirurgicale, Tom.* 1, *p.* 192.) Yet we find that M. Tenon himself must give up the claim of priority to Ætius, and other ancients. The merit of the thing appears to me to consist in the revival of the practice, if it have any advantages, which is now doubtful.

M. Richerand seems also offended, that Hunter's name should be affixed to an operation, which he conceives was in reality the invention of Guillemeau. Here we observe, Ætius again puts in a prior claim, and, with much more effect, because his operation truly resembled Mr. Hunter's, inasmuch as it was done at some distance above the swelling, while Guillemeau only tied the artery close above the disease, and opened the swelling, a serious deviation from the Hunterian practice.

Guillemeau (says Richerand) a contemporary, and disciple of Ambrose Paré, having to treat a tumour of blood, at the bend of the arm, in consequence of bleeding, exposed the artery above the tumour, tied this vessel, then opened the sac, took out the coagulated blood contained in it, and dressed the wound, which healed by suppuration. After more than a century, Anel, on being consulted about a similar case, tied the artery above the swelling, but left this to itself. The pulsations ceased, the tumour became smaller, and hard, and after some months, no traces of the disease were perceptible.

In 1785, Desault operated in the same manner for a popliteal aneurism: the swelling diminished by one half, and the throbbings ceased; on the 20th day, it burst, coagulated blood and pus were discharged in large quantities, and the wound, after continuing a long time fistulous, at length healed. Towards the end of the same year, says Richerand, Hunter applied the ligature somewhat differently; instead of placing it close to the swelling, or directly above it, he put it on the inferior part of the femoral artery. (See *Richerand's Nosographie Chirurgicale, Tom.* 4. *p.* 98, 99, *edit.* 2.)

Unquestionably, M. Anel did in one solitary instance, tie the humeral artery immediately above an aneurism at the bend of the arm, and effected a cure without opening the swelling; but he did not think of applying the plan to the femoral artery, or draw the attention of the French surgeons sufficiently to the matter, to make the latter imitate his operation: on the contrary, the method fell into oblivion, and was never practised. With regard to Desault's operation, said to have been done in an earlier part of 1785, than Mr. Hunter's first operation, it is only necessary to say, that Desault tied the popliteal artery itself, while the grand object in Mr. Hunter's method was to take up the femoral artery, at a distance from the disease, and that it is this last mode alone, which has gained such approbation, and been attended with unparalleled success.

The French surgeons have not practised the Hunterian operation with the same degree of success with which it is now performed in England, and consequently they very commonly pursue the old method of opening the sac, &c. Even Professor Boyer avers his relinquishment of what he calls Anel's plan. (*Traité des Mal. Chir. T.* 2. *p.* 148.) But we shall not be surprised at their ill success, when we hear that they are totally ignorant of the right principles on which ligatures ought to be applied to arteries, as explained by Dr. Jones in his work on hemorrhage. Boyer applies four loose ligatures round the artery, besides two tight ones; and consequently a large portion of the vessel lies separated from its natural connexions, and irritated by these extraneous substances. Hunter's first operation nearly failed also on account of so many ligatures, none of which were tightened so as to cut through the inner coats of the artery, and thus promote its closure. (See *Hemorrhage.*)

Mr. Astley Cooper has published a case of popliteal aneurism, in which a particular occurrence happened, that led this gentleman to make a little innovation in the method of tying arteries for the cure of aneurisms.

The femoral artery had been tied with two ligatures, as firmly as could be done without risk of cutting it through. "But (says Mr. A. Cooper) as I was proceeding to dress the wound, I saw a stream of blood issuing from the artery, and when the blood was sponged away, one of the ligatures was found detached from the vessel. Soon after the other was also forced off, and thus the divided femoral artery was left without a ligature, and unless immediate assistance had been afforded him, the patient must have perished under hemorrhage."

The same kind of accident has occurred in Mr. Cline's practice.

These events naturally induced Mr. A. Cooper to reflect on the means, which were to be employed to obviate them, and the first which suggested itself was to include a larger portion of the artery between the two ligatures. But this plan was given up, when it was recollected, that many branches of arteries must be divided, and that it was a mode of security (if it was so) which could only apply to particular cases of aneurism, since in some situations of that disease, there is scarcely any length of vessel between the tumour and principal anastomosing branch of the artery.

Mr. A. Cooper thinks, that a plan of greater security, and more general application, consists in conveying the ligatures, by means of two blunt needles, under the artery, an inch asunder, and close to the coats of the vessel, excluding the vein and nerve, but passing the threads through the cellular membrane surrounding the artery. When these are tied, and the artery is divided between them, the ligatures will be prevented from slipping from the artery by the cellular membrane through which they are passed. Mr. A. Cooper next relates a case of aneurism after bleeding, which he cured by this way of operating.

"But although this plan, as to the event, answered my expectations, yet a different mode of securing the ligature, suggested to me by my young friend Mr. H. Cline, struck me so forcibly for its simplicity and security, that I felt immediately disposed to adopt it."

Mr. A. Cooper put the new plan to the test of experiment in operating for a popliteal aneurism on Henry Figg, aged 29. "An incision being made on the middle of the inner part of the thigh, and the femoral artery exposed, the artery was separated from the vein and nerve, and all the surrounding parts, to the extent of an inch, and an eye-probe, armed with a double ligature, having a curved needle at each end, was conveyed under the artery, and the probe cut away. The ligature nearest the groin was first tied; the other was separated an inch from the first, and tied also. Then the needles were passed through the coats of the artery, close to each ligature and between them. The thread they carried, was tied into the knot of the ligature, which had been already secured around the vessel; and thus a barrier was formed in the artery, beyond which the ligature could not pass." The event of this operation was successful. (*Med. and Phys. Journ. Vol.* 8.)

Upon the foregoing proposal a few observations are necessary, and these I shall offer with due deference to the eminent character, whose fame alone has attached undue importance to the innovation.

In the first place I shall prove that Mr. H. Cline's proposal is not an original one. It appears to have been mentioned by Dionis, and to have been noticed by some subsequent writers. In the 13th chapter, on hemorrhage, in Richter's *Anfangsgrunde der Wundarzneykunst*, we read the following passage. *Die hervorgezogne schlagader umwickelt man mit dem gewõhnlichen faden zweymal, befestigt denselben mit einem knoten, ziehet darauf, wenn die schlagader gross ist, vermittelst einer nadel ein ende des fadens vor der unterbindung durch dieselbe, knũft beyde enden zusammen, und lãsst sie wie gewõhnlich herabhãngen. Dritte Auflage.* 1799. "The artery, when drawn out, is to be twice surrounded with the common ligature. This is to be tied in a knot, and when the artery is large, one end of the ligature is to be passed, by means of a needle, through the vessel before the knot, then both ends are to be tied together, and left hanging out of the wound, as in the ordinary way." Edition 3. 1799. In making this quotation, my object is to remove the supposition, that the world is indebted to Mr. H. Cline for the suggestion, if we may use the term indebted, when the plan has certainly very little merit, and would undoubtedly never have acquired much celebrity, had not Mr. A. Cooper's name been coupled with it.

What power can possibly force the ligature, when tied with due tightness, off the extremity of the vessel? If Mr. A. Cooper had reflected a little, he would have seen, that no action of the heart, or artery itself, no turgid state of this vessel, could do so. If a piece of string were tied round any tube for the purpose of preventing a fluid from escaping from its mouth, provided the string is applied with due tightness, no fluid can possibly escape, however great the propelling power may be, supposing that the string, and structure of the tube, do not break. If the ligature be applied so slackly as to slip, who can doubt, that hemorrhage will still follow, even though the ligature is carried through the end of the vessel, and tied in the way mentioned above?

In the cases, in which the ligatures slipped off, as mentioned by Mr. A. Cooper, we must, therefore, conclude that the arteries were not tied with sufficient tightness, perhaps through an unfounded fear that a ligature might cut its way completely through all the coats of an artery. The inner coats of the artery we know, from the experiments of Dr. Jones, are invariably cut through when the vessel is properly tied, and the circumstance is always useful in promoting its closure.

### OF ANEURISMS HIGH UP THE FEMORAL ARTERY.

The ligature of the external iliac artery, for aneurisms of the femoral artery in the bend of the groin, has now been practised so frequently, and the instances of success are so numerous, that all doubt concerning the propriety and utility of the attempt has entirely ceased, at least, in this country. The French, who have evinced great backwardness in espousing the Hunterian method of operating for aneurisms, though it is decidedly one of the greatest improvements in modern surgery, have also shewn great reluctance even to believe, much less to practise, the operation of tying the external iliac artery. A Parisian surgeon, however, who was recently in London, saw the thing done, and his brethren in the capital of France now begin to have their eyes a little more opened. Still, as M. Roux remarks, "We cannot but blame the indifference with which the operation is mentioned in some of the latest French surgical publications. At this moment (1815), we can reckon twenty-three facts relative to tying the external iliac artery, and on fifteen of the patients it has perfectly succeeded. In these twenty-three operations, I comprehend the two which were done in France; one at Brest, by M. Delaporte, and the other at Lyons, by M. Bouchet; cases, of the authenticity of which we cannot doubt. In the number of successful cases, is to be comprised M. Bouchet's operation, since the patient lived more than a year afterwards, and then died of the consequences of an inguinal aneurism of the opposite side. Of the other twenty-one operations, fifteen have been performed in London only, in the several hospitals of this metropolis, by Abernethy, Ramsden, A. Cooper, Brodie, and Lawrence, gentlemen who would never publish forged cases.

"Mr. A. Cooper alone had tied the external iliac artery six times before my journey to London, and during my stay there, I saw him perform the operation once. Four of his patients were entirely well; one of the three others died, the thirteenth week after the operation, of the bursting of an aneurism of the aorta. At this period, the circulation in the limb had been re-established. I saw the limb, after it had been injected, amongst Mr. Cooper's anatomical preparations. Large and beautiful anastomoses existed round the pelvis, between the dilated branches of the internal iliac and femoral arteries. With respect to the sixth patient, the leg mortified, and the thigh was amputated without success. The seventh died of an hemorrhage, which took place the fourteenth or fifteenth day after the operation." (*Parallèle de la Chir. Angloise avec la Chir. Françoise, p.* 275—276.)

After the battle of Waterloo, the external iliac artery was tied in two instances, which came to my knowledge. The operations were done by my friends, staff surgeons Cole and Collier; but, did not succeed. In the case of the first gentleman, the circulation went on very well, and the patient died of another cause. In Mr. Collier's instance, the limb mortified. In both examples, the necessity of the operation was induced by gunshot wounds.

Even on the other side of the Atlantic, the operation has now been practised with success. The many facts, which have already been published, must be highly gratifying to Mr. Abernethy, by whose judgment the method was first suggested, and by whose enterprizing hand it was first practised.

Mr. Abernethy has been called upon in several cases to take up the external iliac artery. The events of all these have shewn, that the anastomosing vessels were fully capable of conveying blood enough into the limb below, and that a vessel even of this size could become permanently closed after being tied. Messrs. Freer and Tomlinson, of Birmingham, have both also done the same operation with success. Our limits, however, will only allow us to describe the operation, and the particulars must be consulted in *Abernethy's Surg. and Physiol. Essays; his Surgical Observations,* 1804; *Edinb. Med. and Surg. Journal for January,* 1807; *and Freer's Observations on Aneurism,* 1807.

In Mr. Abernethy's first operation of this kind, an incision, about three inches in length, was made through the integuments of the abdomen, in the direction of the artery, and thus the aponeurosis of the external oblique muscle was laid bare. This was next divided, from its connexion with Poupart's ligament, in the direction of the external wound, for the extent of about two inches. The margins of the internal oblique and transverse muscles being thus exposed, Mr. Abernethy introduced his fingers beneath them to protect the peritoneum, and then divided them. Next he pushed this membrane with its contents upwards and inwards, and took hold of the external iliac artery with his finger and thumb. It now only remained to pass a ligature round the artery, and tie it; but, this required caution, on account of the contiguity of the vein to the artery. These Mr. A. separated with his fingers, and introducing a ligature under the artery with a common surgical needle, tied it about an inch and a half above Poupart's ligament. (*Surg. Essays.*)

The following was the method Mr. Abernethy adopted the second time of tying the external iliac artery.

An incision of three inches in length was made through the integuments of the abdomen, beginning a little above Poupart's ligament, and being continued upwards; it was more than half an inch on the outside of the upper part of the abdominal ring, to avoid the epigastric artery. The aponeurosis of the external oblique muscle being thus exposed, was next divided, in the direction of the external wound. The lower part of the internal oblique muscle was thus uncovered, and the finger being introduced below the inferior margin of it and of the transversalis muscle, they were divided with the crooked bistoury for about one inch and a half. Mr. Abernethy now introduced his finger beneath the bag of the peritoneum, and carried it upwards by the side of the psoas muscle, so as to touch the artery about two inches above Poupart's ligament. He took care to disturb the peritoneum as little as possible, detaching it to no greater extent than would serve to admit his two fingers to touch the vessel. The pulsations of the artery made it clearly distinguishable, but Mr. Abernethy could not get his finger round it with facility. He was obliged to make a slight incision on either side of it, in the same manner as is necessary when it is taken up in the thigh, where the fascia which binds it down in its situation is strong. After this the forefinger could be put beneath the artery, which Mr. A. drew gently down, so as to see it behind the peritoneum. By means of an eye-probe, two ligatures were conveyed round the vessel; one of these was carried upwards as far as the artery had been detached, and the other downwards: they were firmly tied, and the vessel was divided in the interspace between them. (*Surg. Observ.* 1804.)

Mr. Abernethy, in his third instance of tying this vessel, operated exactly as in the foregoing case, and with complete success. (See *Edinb. Surg. Journ. Jan.* 1807.)

Mr. Freer, in his operation, made an incision about one inch and a half from the spine of the ilium, beginning about an inch above it, and extending it downwards about three inches and a half, so as to form altogether an incision four inches and a half long, extending to the base of the tumour. The tendon of the external oblique being exposed, was carefully opened, and also the internal oblique, when the finger was introduced between the peritoneum and transversalis, and served as a director for the crooked bistoury, which divided the muscle. Avoiding all unnecessary disturbance, Mr. Freer separated the peritoneum with his finger, till he could feel the artery beating, which was so firmly bound down, that he could not get his finger under it without dividing its fascia. The vessel being separated from the surrounding parts, a curved blunt needle, armed with a strong ligature, was put under it, and tied very tight, with the intention of dividing the internal coats of the vessel. The operation led to a perfect cure. (*Freer on Aneurism, p.* 83.)

Mr. Tomlinson applied only one ligature, and, of course, left the artery undivided: the event was attended with perfect success.

The following is Mr. A. Cooper's mode of operating, as described by Mr. Hodgson. A semilunar incision is made "through the integuments, in the direction of the fibres of the aponeurosis of the external oblique muscle. One extremity of this incision will be situated near the spine of the ilium: the other will terminate a little above the inner margin of the abdominal ring. The aponeurosis of the external oblique muscle will be exposed, and is to be divided throughout the extent and in the direction of the external wound. The flap, which is thus formed, being raised, the spermatic cord will be seen passing under the margin of the internal oblique, and transverse muscles. The opening in the fascia, which lines the transverse muscle, through which the spermatic cord passes, is situated in the midspace between the anterior superior spine of the ilium, and the symphysis pubis. The epigastric artery runs precisely along the inner margin of this opening, beneath which the external iliac artery is situated. If the finger, therefore, be passed under the spermatic cord, through this opening in the fascia, it will come into immediate contact with the artery, which lies on the outside of the external iliac vein. The artery and vein are connected together by dense cellular membrane, which must be separated to enable the operator to pass a ligature, by means of an aneurism needle, round the former." (See *Hodgson's Treatise on Diseases of Arteries, p.* 421—422.)

The foregoing incision, the convexity of which is turned outward, and downward, extends from within and a little above the anterior superior spinous process of the ilium to above and a little within the middle part of Poupart's ligament.

I have already noticed the general backwardness of the French to credit, much less imitate, the bold and successful conduct of the surgeons of this country in the treatment of certain aneurisms. It is but a little while since M. Richerand, one of the leading surgeons at Paris, published the following sentiments on the subject: "*Lorsqu' un aneurisme a commencé vers la partie la plus élevée de la crurale, au moment même ou elle vient de sortir de l'abdomen, peut-on se permettre d'inciser la partie inférieure de cette cavité, de couper l'arcade crurale, et de chercher l'artère iliaque externe, pour l'embrasser par la ligature? S'il en fallait croire des observations inserées dans la Bibliothèque britannique, cette operation hardie aurait été faite avec succès à Londres, par le docteur Abernethy, dans un cas d'anéurisme du commencement de la crurale; ce praticien n'hésita pas, dit on, de pénétrer dans le bassin, en incisant le ligament de Fallope; mais, en mettant de côté la difficulté de l'operation dans laquelle on est obligé de travailler en sous-œuvre, et sans que la vue puisse guider l'aiguille, que l'on passe autour du vaisseau, la ligature simultanée, de la veine iliaque, et des nerfs placés sur les côtés du détroit supérieur du bassin, occasionnera la gangrène. Quels vaisseaux continueront à nourrir le membre dans le défaut presque absolu d'anastomoses? Enfin, dans la supposition peu probable, qu'il ne tombât pas en gangrène, des hernies énormes seraient l'inevitable resultat de l'affaiblissement des parois abdominales.*" (*Richerand, Nosographie Chirurgicale, Tom.* 4, *p.* 106—107, *edit.* 2.)

In his fourth edition, however, he is much changed. He acknowledges the ease with which the operation may be done; but thinks, with every body else, that it is a proceeding, which should never be resorted to, except in the case of urgent necessity.

Some of the cases, on which Mr. Abernethy operated, I was an eye-witness of, and can therefore bear testimony to the ease and simplicity of the necessary operation. The external iliac artery was most readily tied the beginning of the year 1812, by the late Mr. Ramsden, when the aneurismal swelling rose much higher than Poupart's ligament. The patient, it is true, died; but, his age was not less than 70; and, yet, notwithstanding this circumstance, the limb had a full supply of blood, and not the least tendency to gangrene shewed itself.

The many operations, which have now been done on the external iliac artery, have impressed me with a conviction, that in subjects under a certain age, there is no reason to fear, that the anastomoses will not generally suffice for the supply of the lower extremity. Out of twenty-five cases, I only know of three in which the limb was attacked with gangrene. These three were patients of Mr. A. Cooper, M. Bouchet, of Lyons, and Mr. Collier, staff-surgeon. The proportion is not so much as one in eight. The three instances of gangrene were not all in the circumstances, which permitted the event to be imputed to the anastomoses not having had sufficient time to enlarge, though perhaps Mr. Collier's case was such. On the other hand, we are to notice, that Mr. Cole's patient was operated upon a few days after the wound, and yet the limb was duly supplied with blood, and did not become gangrenous. It appears therefore to me, that the occasional occurrence of gangrene cannot be admitted as a just reason for delay, until the collateral vessels have had time to enlarge. I believe, that, in all aneurismal diseases, early operating is the best, and most judicious practice. I say this, not without recollecting, that all aneurisms are attended with a chance of getting spontaneously well in time. I saw the inguinal aneurism, which did so, under Mr. Albert, in the York hospital; but as this also is a rare incident, I do not believe that it ought to influence us against having speedy recourse to an operation. Besides, the cure by inflammation and sloughing, appears to me to be attended in reality with more peril, than a well executed operation, and consequently, has less recommendations, than many may imagine. Had not Mr. Albert's patient been a very strong man, he would certainly have fallen a victim to the extensive disease, which the bursting and sloughing of the tumour created. M. Delaporte's patient died of the mass of disease, which the tumour itself made; for it had been suffered to attain too large a size, so that when it inflamed, the effects were fatal. (See *Richerand, Nosogr. Chir. T.* 4, *p.* 113, *edit.* 4.)

### CASE OF GLUTÆAL ANEURISM CURED BY TYING THE INTERNAL ILIAC ARTERY.

The glutæal artery is large; from its situation, liable to wounds; from its size, subject to aneurism. Dr. Jeffray, of Glasgow, was consulted in a case, where the glutæal artery had been wounded. He urged the propriety of tying the vessel where it had been injured. This sensible advice was at first rejected, and when the friends at last consented, the operation was too late, as while preparation was making for it, the tumour burst, and the patient expired in a few moments.

Mr. John Bell, however, had a case in which he tied the glutæal artery which had been wounded, and the patient was saved.

Mr. Stevens, surgeon in Santa Cruz, the gentleman who has proved the practicableness of putting a ligature round the internal iliac artery, informs us, that " one of the first surgeons in London had a patient with glutæal aneurism. The tumor was large; allowed to burst; and the person bled to death.

" I sincerely trust that the following case may be the means of preventing such an occurrence in future.

" Maila, a negro-woman, from the Bambara country in Africa, was imported as a slave into the West Indies in the year 1790. She was purchased for the estate Enfield Green; now the property of the heirs of P. Ferrall, Esq. I saw her first in the beginning of December, 1812. She had a tumour on the left hip, over the sciatic notch. It was nearly as large as a child's head, and pulsating very strongly. She could assign no cause for the disease. It had commenced about nine months before, with slight pain in the part; and had gradually increased to its present size. She was now much reduced, in great misery, and ready to submit to any operation." (See *Medico-Chir. Trans. Vol.* 5, *p.* 425.)

After a few other particulars, Mr. Stevens notices, that he had tied the internal iliac on the dead body, and that he believed it might be done with safety on the living.

The following is some account of this operation, as practised upon the above negro-woman.

" On the 27th December, 1812 (says Mr. Stevens), I tied the artery in the presence of Dr. Lang, Dr. Van Brackle, Mr. Nelthropp, and Mr. Ford the manager of the estate.

" An incision, about five inches in length, was made on the left side, in the lower and lateral part of the abdomen, parallel with the epigastric artery, and nearly half an inch on the outer side of it. The skin, the superficial fascia, and the three thin abdominal muscles, were successively divided; the peritoneum was separated from its loose connexion with the iliacus internus and psoas magnus; it was then turned almost directly inwards, in a direction, from the anterior superior spinous process of the ilium, to the division of the common iliac artery. In the cavity, which I had now made, I felt for the internal iliac, insinuated the point of my fore-finger behind it, and then pressed the artery betwixt my finger and thumb. Dr. Lang now felt the aneurism behind; the pulsation had entirely ceased, and the tumor was disappearing. I examined the vessel in the pelvis; it was healthy and free from its neighbouring connexions. I then passed a ligature behind the artery, and tied it about half an inch from its origin. The tumour disappeared almost immediately after the operation, and the wound healed kindly. About the end of the third week the ligature came away, and in six weeks the woman was perfectly well."

This is the first example in which the internal iliac has been tied. The operation was not attended with much difficulty nor pain, and not an ounce of blood was lost.

Mr. Stevens had no difficulty in avoiding the ureter, which, when the peritoneum was turned inwards, followed it. Had it remained over the artery, Mr. Stevens says, that he could easily have turned it aside with his finger. (See a particular history of this case in *Medico-Chirurg. Trans. Vol.* 5, *p.* 422, &c.)

### ANEURISMS OF THE BRACHIAL ARTERY, AND THE OPERATION FOR THEM.

Surgical writings contain many histories of aneurisms in the bend of the arm, produced by the puncture of the brachial artery in venesection, or caused by a deep wound inflicted at the bend of the arm, along the inner side of the humerus, or in the axilla. Such cases must indisputably be formed by effusion. Although Morand, &c. have found, that along with aneurisms, caused by a wound of the brachial artery, the diameter of the vessel is sometimes unusually enlarged through its whole length, above the seat of the tumour, this enlargement, which is very rare, might have existed naturally, before the puncture occurred. Even were it frequent, such an equable longitudinal expansion of the tube of the artery could not explain the formation of the aneurismal sac in the bend of the arm, along the inner side of the humerus, or in the axilla, after wounds. (*Scarpa, p.* 160.)

The proximate cause of these cases may invariably be traced to the solution of continuity in the two proper coats of the artery, and the consequent effusion of blood into the cellular substance. The effect is the same, whether from an internal morbid affection, capable of ulcerating the internal and fibrous coats of the artery, the blood be effused into the neighbouring cellular sheath surrounding the artery, which it raises after the manner of an aneurismal sac; or, the wound of the integuments having closed, the blood issue from the artery, and be diffused in the surrounding parts. The cellular substance, on the outside of the wounded vessel, is first injected, as in ecchymosis; the blood then distends it, and elevates it in the form of a tumour, and, the cellular divisions being destroyed, converts it at last into a firm capsule, or aneurismal sac. (*Scarpa, p.* 167.)

The circumscribed or the diffused nature of the aneurism, and the rapidity or slowness of its formation, depend on the greater or less resistance to the impetus of the blood, during the time of its effusion, by the interstices of the cellular substance surrounding the artery, and by the ligamentous fasciæ and aponeuroses, lying over the sac. The aponeurosis of the biceps muscle, being only half an inch broad, and situated lower than the common place for bleeding, cannot, at least, in most cases, materially strengthen the cellular substance surrounding the artery, as is commonly supposed. (*Scarpa, p.* 168—170.) This author refers the greatest resistance to the intermuscular ligament, which after having covered the body of the biceps muscle extends over the whole course of the humeral artery, and is implanted into the internal condyle. This ligamentous expansion has a triangular shape, the base of which extends from the tendon of the biceps, to the internal condyle, while the apex reaches upward along the inner side of the humerus towards the os brachii. The humeral artery and median nerve, kept in their situation by the cellular sheath, and this ligamentous expansion, run in the furrow, formed between it and the internal margin of the biceps. (*Scarpa,* 171.) This author anatomically explains many circumstances relative to the diffusion, circumscription, shape, &c. of brachial aneurisms, from this intermuscular ligament. While aneurisms, from an internal cause, are not unfrequent in the aorta, thigh, and ham, they are very rare in the brachial artery; but, such instances, however, are recorded. (*Scarpa,* 174. *Pelletan's Clinique Chir. T.* 2, *p.* 4.)

The mode of distinguishing a wound of the brachial artery, in attempting to bleed, and the method of trying to effect a cure by pressure, are described in the article *Hemorrhage.*

Anel is said to have been the first who tied the brachial artery, for the cure of aneurisms in the arm, in the same way that Hunter did the femoral, for the cure of those in the ham, viz. with one ligature above the tumour, without making any incision upon, or into, the sac itself.

The operation is performed as follows:—the surgeon having traced the course of the brachial artery, and felt its pulsations above the aneurism, he may either cut down to the vessel immediately above the tumour, or much higher in the long space between the origins of the superior and inferior collateral arteries. The integuments are to be divided in the course of the artery, and also the cellular sheath, for the space of about two inches and a half. The surgeon now introducing his left fore-finger to the bottom of the wound, will feel the denuded vessel, and, if it is not sufficiently bare, he must divide the parts which still cover it, observing to introduce the edge of the knife, on the side next to the internal margin of the biceps, to avoid dividing any of the numerous muscular branches, which go off from the opposite side of the artery. He is then to insulate, with the point of his finger, the trunk of the vessel, alone if he can, or together with the median nerve and vein, and raise it a little from the bottom of the wound. He is to separate the median nerve and vein, for a small space from the artery, and with an eyed needle is to pass a ligature under the latter, and then tie it with a simple knot.

In the operation, it should always be recollected, that the median nerve lies on the inside of the artery, and, therefore, that the instrument used for putting the ligature under the vessel should be passed from within outwards, by which means the inclusion of the nerve may be most easily avoided. (*Boyer, Traité des Maladies Chirurgicales, &c. T. 2, p.* 193.)

The operation is well described by Mr. Hodgson: "The surgeon divides the integuments along the ulnar margin of the biceps muscle, by an incision two inches and a half in length. The thin fascia, which surrounds the arm will thus be exposed, and must be cautiously divided in the direction of the external wound. The artery lies immediately under the fascia, close to the margin of the biceps. The median nerve is situated on the ulnar side of the artery, which lies between its two venæ comites. The internal cutaneous nerve is also situated under the fascia in the middle of the arm, and lies on the ulnar edge of the median nerve. The cellular membrane, which connects these parts, is to be divided, until the coats of the artery are fairly exposed. This part of the operation will be effected with facility, if an assistant compress the artery above the wound, so as to stop the circulation through it, and render it in some degree flaccid. The point of an aneurismal needle is then to be introduced close to the ulnar, and brought out on the radial side of the artery, so as to avoid including the median nerve, or the veins which accompany the artery." (See *Hodgson's Treatise on Diseases of the Arteries, &c. p.* 391.)

Whoever, after the above directions, says Scarpa, shall have the treatment of a *circumscribed* aneurism in the bend of the arm, will no longer, it is to be hoped, follow the method of those, who, supposing the tumour to be formed by the dilatation of the artery, used first to divide the integuments over the tumour, insulated the sac, and sought for the vessel above and below the aneurism, in order to tie it in two places; and then endeavoured to make the sac slough away. The operation is now reduced to the greatest simplicity, viz. tying the artery merely above the tumour. (See *Scarpa, p.* 358, 359.)

When the aneurism is *diffused*, and accompanied with violent inflammation and swelling of the whole arm, from the excessive distention of the clots of effused blood, Scarpa recommends the old operation of opening the tumour, and tying the artery at the bottom of the sac, above and below the wound made by the lancet. In this method it will be proper to apply a tourniquet to the upper part of the arm, near the axilla; or, if the limb should be very painful and swelled, it is better to let an assistant compress the artery from above the clavicle, against the first rib. The incision having been made into the tumour, and the blood discharged, a probe is to be introduced into the puncture in the vessel, from below upwards, so as to raise the artery. This, being separated from the parts beneath, and the median nerve, for a small extent, is to have two ligatures put under it, one of which is to be tied above, the other below, the wound in the vessel. Then the tourniquet, or pressure, is to be taken off, and if there be no bleeding, the wound is to be brought together. (See *Scarpa, p.* 359.)

### MR. LAMBERT'S PROPOSAL.

Having observed, after an operation performed in the common way, by a ligature above and below the aperture in the artery, such violent pain, swelling and inflammation, as threatened gangrene of the limb, and which symptoms, when mitigated, left the arm weak, and with a much more feeble pulse, than in the other arm, this gentleman wished to see the operation done, so as to make less disturbance of the circulation. "I recollected," he remarks, "all that I had seen or read of the effects of styptics, of pressure, and of ligatures, in the cure of hemorrhages. I considered the coats and motions of arteries, and compared their wounds with the wounds of veins and other parts. I reflected upon the process of nature in the cure of wounds in general, and considered, in particular, how the union of divided parts was brought about in the operation of the harelip, and in horses necks, that are bled by farriers. Upon the whole, I was in hopes, that a suture of the wound in the artery might be successful; and, if so, it would certainly be preferable to tying up the trunk of the vessel. I communicated my thoughts to Mr. Hallowell, Mr. Keenlyside, and some other friends of the profession. A case of an aneurism from bleeding occurred, and fell to Mr. Hallowell's lot. I recommended the method I have hinted. He put it in execution June 15, 1759. Every thing was done in the usual method, till the artery was laid bare, and its wound discovered; and the tourniquet being now slackened, the gush of blood *per saltum* shewed there was no deception. Next, two ligatures, one above the orifice, and one below, were passed under the artery, that they might be ready to be tied at any time, in case the method proposed should fail. Then a small steel pin, rather more than a quarter of an inch long, was passed through the two lips of the wound in the artery, and secured by twisting a thread round it, as in the harelip. This was found to stop the bleeding, upon which the arm was bound up, the patient put to bed, and ordered to be kept quiet, &c. The pin came away with the dressings, June 29, and July 19th, the patient was discharged from the hospital perfectly well, and with a pulse in that arm nearly as strong as in the other. Indeed, the pulse was very little altered immediately after the operation; it was weakened in a small degree, as might be expected from the diameter of the vessel being straitened; but it was so strong and equal, that we had not the least doubt of the blood's continuing to circulate freely through it." (*Medical Observations and Inquiries, Vol.* 2.)

We need hardly inform the reader, that the idea of healing the wound in the vessel, so as to preserve the pervious state of it, is a mere hypothesis, certainly never realized by adopting Mr. Lambert's method. If ever a small puncture of an artery heals, so as to leave the tube pervious, it is under the circumstances pointed out by Dr. Jones. (See *Hemorrhage.*) Had Lambert had an opportunity of examining the state of the vessel, some time after the above operation, he would have found its canal obliterated; and the preservation of the perviousness of the artery being the only foundation for Lambert's method, the practice must of course fall to the ground.

### AXILLARY ANEURISMS.

Aneurisms occasionally take place in the axilla, and rather than that the patient should perish of hemorrhage, it is the duty of the surgeon to tie the subclavian artery, if it be necessary, even as far inward, as where it proceeds over the first rib. A question here naturally presenting itself, is, whether the surgeon should attempt the operation in an early period of the disease, or wait till circumstances are urgent; the aneurism large and far advanced; the arm œdematous and insupportably painful; and the tumour in danger of bursting? It cannot be denied, that, in all cases of aneurism, there is a certain chance of the disease getting spontaneously well; and one axillary aneurism in a man in St. Bartholomew's Hospital a few years ago, had certainly disappeared of itself, as was proved by the account which the man gave of the case while living, and by the obliteration of the artery, found on inspection after death.

I believe, however, we ought not to suffer our conduct to be too much influenced by the hope of so unfrequent an event, and, from the observations, which I have made on this subject, I am now decidedly of opinion, that the operation should never be delayed, so as to allow the tumour to acquire an immoderate size. The operation is always difficult; but, the difficulty is seriously increased, when the swelling has extended far towards the breast, and has become so large as to push the clavicle considerably upwards. The memorable and interesting examples, in which Mr. Keate and Mr. Ramsden tied the subclavian artery, have shewn, that the anastomoses are fully competent to the supply of the limb with blood, and, I think, that delaying the operation, with a view of allowing the inosculating arteries to enlarge, is not necessary, and, as giving time for the swelling to increase, ought to be condemned. At all events, the tumour should never be suffered to acquire an enormous size.

That the limb would receive an adequate supply of blood was well proved, even without the performance of the operation, by cases in which the axillary and subclavian arteries had been rendered impervious by disease. (For an account of such facts, the reader is particularly referred to *Hodgson's Treatise on the Diseases of Arteries, p.* 111; *Journal de Médecine by Corvisart, Leroux and Boyer, T.* 2, *p.* 29; *Corvisart Essai sur les Maladies du Cœur, p.* 215.)

"In these cases (says Mr. Hodgson) the only unusual circumstance, which was observed during the life of the patients, was the deficiency of the pulse at the wrist. The limbs were well nourished, although a considerable extent of the main artery (the subclavian) was obliterated, even before it had given off any branches." (*P.* 347.)

A wound of the axillary artery, might render it necessary to do this operation. This vessel was tied by a Mr. Hall, in Cheshire, when it had been wounded with a scythe, so as to bring the ends of the artery into view; and the arm was preserved, though it remained afterwards a little weak, which, indeed, might be owing to some large nerve being divided. (See *Bell on Wounds, p.* 60, *edit.* 3, and *Scarpa, p.* 372.) Mr. White, of Manchester, relates another instance of this vessel being tied, in the case of a wound; but, mortification of the limb, and death followed. Three of the nerves were found included in the ligature. (*London Medical Journal, Vol.* 4.)

There are two modes of operating for axillary aneurisms; one by cutting below the clavicle; the other by making the wound above this bone.

The first of these methods has been attempted in France by Desault and Pelletan. The former undertook the operation in a case, where the axillary artery had been wounded. An incision, six inches long, was made below the external third of the clavicle; two thoracic arteries cut were immediately tied; the two lower thirds of the great pectoral muscle were next divided with a bistoury guided on a director; a large quantity of coagulated blood was now discharged; and the artery was directly taken hold of, and tied, together with the brachial plexus of the nerves. The arm mortified, and the patient died. This case, we must agree with Scarpa, was not a fair trial of the operation, inasmuch as the inclusion of the plexus of nerves in the ligature was an improper measure, and must have promoted the occurrence of sphacelus. It seems also probable from the account, that the vein was likewise tied; another serious and objectionable proceeding. Besides, it is worthy of notice, that the case was a wound of the axillary artery, attended with a copious effusion of blood in the cellular membrane. In all examples of this kind, gangrene is more readily induced, than when the case is a mere circumscribed aneurismal tumour. (See *Œuvres Chir. de Desault par Bichat. Tome* 2, *p*. 553.) As for Pelletan's example, it hardly deserves recital, because the operation in fact was not achieved. His colleagues objected to dividing the pectoral muscle; a random thrust was made with a needle and ligature; but, the artery was not included, and the experiment was not repeated. (See *Clinique Chirurgicale, Tom.* 2, *Obs.* 7, *p.* 49.)

In a case of axillary aneurism, which had actually burst, and the hemorrhage from which could only be stopped by pressing the artery against the first rib, Mr. Keate, the surgeon-general, practised the following operation, which was attended with completely successful consequences. This gentleman determined on taking up the artery, above the diseased and ruptured part, in its passage over the first rib. Accordingly, he made an incision obliquely downwards, divided the fibres of the pectoral muscle, that were in his way, and, when he came to the artery, passed a curved, blunt-pointed, silver needle, armed double, as he conceived, under the artery, and tied two of the ends. After a careful examination, finding that the artery pulsated below the ligature, he determined on passing another ligature higher up, and nearer to the clavicle: he, therefore, passed the needle more deeply, so as evidently to include the artery. In a few days the swelling of the arm began to subside, the wound suppurated, and the ligatures came away with the dressings. The arm afterwards recovered its feeling, and the patient regained, in a great measure, the entire motion of the shoulder, &c. (See *Med. Review and Magazine for* 1801.)

Mr. Keate's operation is objectionable, inasmuch as it was a dive made with a needle, and attended with great danger of wounding and tying parts, which should be left undisturbed.

The subclavian artery might be got at below the clavicle, as follows; the surgeon is to make an incision, through the integuments, about an inch from the sternal end of this bone. The cut is to run in the direction towards the acromion, deviating a little downward from a line parallel to that of the clavicle. This wound will bring into view some fibres of the great pectoral muscle originating from the last mentioned bone. These are next to be divided. Some cellular substance will be found underneath, which is to be carefully raised with a pair of dissecting forceps, and cut. The operator will thus arrive at the great subclavian vein, and cephalic vein uniting with it. Under the subclavian vein, and a little further backward, more under the clavicle, the subclavian artery may be felt and tied. (See *Charles Bell's Operative Surgery, Vol.* 2. *p.* 370.)

The axillary artery may be got at by making an incision above the clavicle, and it is undoubtedly not a very difficult plan to accomplish in the dead subject, without any tumour under the clavicle. But it is more difficult in a living subject, having a large axillary aneurism; for, then the clavicle becomes so much elevated, and the artery lies so deeply below it, that the vessel can hardly have a ligature carried under it, without a particular needle for the purpose. This was the case in an attempt which I once saw made to tie the artery, and in which one of the cervical nerves, affected by the pulsation of the artery, was mistaken for it, and tied, so that the aneurism soon afterwards burst, and a fatal hemorrhage arose. Were a surgeon to operate above the clavicle, he should adopt the following plan:—An incision should be made just over the sternal end of the clavicle, and the clavicular portion of the sterno-cleido-mastoideus muscle be detached with a blunt pointed curved bistoury. No further use should be made of a cutting instrument. The chief difficulty would now be, to get a ligature under the artery; but, it may be done with the aid of an ingenious needle, which Mr. Ramsden has described, and which is exactly similar in principle to one employed by Desault, called by the French *aiguille à ressort.* As the artery communicates its pulsations to the cervical nerves in the vicinity, the operator should be particularly careful not to mistake one of them for the vessel itself.

In order to avoid the inconveniences of the needles ordinarily used for conveying ligatures under deep arteries, Desault (says Bichat) invented "une aiguille à ressort," composed of a silver tube, or sheath, which was straight at one end, and bent at the other in a semicircular form. This sheath enclosed an elastic wire, the projecting extremity of which was accurately fitted to the end of the sheath, and perforated with a transverse eye. The instrument was passed under the artery, and, as soon as it had reached the other side of the vessel, the sheath was kept fixed, while an assistant pushed the elastic wire, which, rising from the bottom of the wound, presented the aperture or eye to the surgeon, who now passed the ligature through this opening. The wire was next drawn back into its sheath again, and the whole instrument brought from beneath the artery, by which means, the ligature was conveyed under the vessel. (See *Œuvres Chir. de Desault, par Bichat, Tom.* 2, *p.* 560.)

The invention of this needle makes a material diminution in the difficulty of taking up the subclavian artery from above the clavicle; nor, can it be wondered, that, without such an instrument, the operation should have baffled even so skilful a surgeon as Mr. A. Cooper.

The following example is the first in which the attempt to tie the subclavian artery, by cutting above the clavicle, was ever accomplished. I conceive, that it reflects great honor on Mr. Ramsden, who undertook it, and who preferred exposing himself to a failure, rather than omit the only possible means of saving his patient from an imminent death.

John Townly, a tailor, aged thirty-two years, addicted to excessive intoxication, of an unhealthy and peculiarly anxious countenance, was admitted into St. Bartholomew's Hospital, on Tuesday, the 2d of November, 1809, on account of an aneurism in the axilla of his right arm, which had been coming on about four months. The prominent part of the tumour in the axilla was about half as big as a large orange, and there was also much enlargement and distention underneath the pectoral muscle, so that the elbow could not be brought near the side of the body.

"The temperature of both arms," says Mr. Ramsden, "was alike, and the pulse in the radial artery of each of them was correspondent. After the patient had been put to bed, some blood taken from the left arm, and his bowels emptied, his pulse, which, on his admission had been at 130, became less frequent; his countenance appeared more tranquil; and he experienced some remission of the distressing sensations in the affected arm: this relief, however, was of short duration; the weight and incumbrance of his arm soon became more and more oppressive, and, in resistance to every medical assistance, his nights were again passed without sleep, and his countenance reassumed the anxiety, which had characterized it, when he first presented himself for advice.

"On the sixth day, after his admission, his decline of health became so very evident, and the progressive elevation of the clavicle, from the increasing bulk of the tumour, was so decidedly creating additional difficulties to any future operation, that I considered it necessary to convene my colleagues, and avail myself of their opinions, as to the propriety of performing the operation; when it was agreed in consultation, that as the tumour, (although increasing) did not appear immediately to endanger the life of the patient, from any probability of its bursting suddenly, it would be advisable yet to postpone the operation, for the purpose of allowing the greatest possible time for the anastomosing vessels to become enlarged; and, in the meanwhile, that the case should be most vigilantly watched.

"About this period of the case, the pulsation of the radial artery of the affected arm gradually became more obscure, and soon after either ceased entirely, or, what is more probable, was lost in the succeeding œdema of the forearm and hand, both of which became loaded to a great extent.

"Notwithstanding the aneurismal tumour had continued to increase, and the patient's health had proportionately declined, yet no particular alteration was observed on the integuments, until I visited him in the evening of the twelfth day after his admission, when I found him complaining of more than usual weariness and weight in the affected limb, and painfully impatient from the impossibility, as he described it, of finding a posture for the arm.

"On examining the tumour, a dark spot appeared on its centre, surrounded by inflammation, which threatened a more extensive destruction of the skin. Under these symptoms and appearances, no farther postponement of the operation being admissible, I performed it the next day in the following manner:

"The patient being placed upon an operating table, with his head obliquely towards the light, and the affected arm supported by an assistant at an easy distance from the side, I made a transverse incision through the skin and platysma myoides along and upon the upper edge of the clavicle, of about two inches and a half in length, beginning it nearest to the shoulder, and terminating its inner extremity at about half an inch within the outward edge of the sterno-cleido-mastoideus muscle. This incision divided a small superficial artery, which was directly secured. The skin, above the clavicle, being then pinched up, between my own thumb and finger, and those of an assistant, I divided it, from within, outwards and upwards, in the line of the outward edge of the sterno-cleido-mastoideus muscle, to the extent of two inches.

"My object, in pinching up the skin for the second incision, was to expose at once the superficial veins, and by dissecting them carefully from the cellular membrane, to place them out of my way, without wounding them. This provision proved to be useful, for it rendered the flow of blood during the operation very trifling comparatively with what might otherwise have been expected; and thereby, enabled me with the greatest facility to bring into view those parts, which were to direct me to the artery.

"My assistant having now lowered the shoulder, for the purpose of placing the first incision above the clavicle, (which I had designedly made along and upon that bone) I continued the dissection with my scalpel, until I had distinctly brought into sight the edge of the anterior scalenus muscle, immediately below the angle, which is formed by the traversing belly of the omo-hyoïdeus, and the edge of the sterno-cleido-mastoideus, and having placed my finger on the artery, at the point where it presents itself between the scaleni, I found no difficulty in tracing it without touching any of the nerves to the lower edge of the upper rib, at which part, I detached it with my finger nail for the purpose of applying the ligature.

"Here, however, arose an embarrassment, which (although I was not unprepared for it) greatly exceeded my expectation. I had learned from repeatedly performing this operation, many years since, on the dead subject, that to pass the ligature under the subclavian artery, with the needle commonly used in aneurisms, would be impracticable; I had therefore, provided myself with instruments of various forms and curvatures to meet the difficulty, each of which most readily conveyed the ligature underneath the artery; but, would serve me no farther; for, being made of solid materials, and fixed into handles, they would not allow of their points being brought up again at the very short curvature, which the narrowness of the space, between the rib and the clavicle afforded, and which, in this particular case, was rendered of unusual depth, by the previous elevation of the shoulder by the tumour.

"After trying various means to overcome this difficulty, a probe of ductile metal was at length handed me, which I passed under the artery, and bringing up its point with a pair of small forceps, I succeeded in passing on the ligature, and then tied the subclavian artery at the part, where I had previously detached it for that purpose. The drawing of the knot was unattended with pain, the wound was closed by the dry suture, and the patient was then returned to his bed." (See *Practical Observations on the Sclerocele, &c. to which are added four cases of operations for Aneurisms, by Thomas Ramsden, surgeon to Christ's Hospital, &c. p.* 276, *&c.*)

It only seems necessary for me to add, that immediately, the artery was tied, the pulsation of the swelling ceased; that the arm of the same side continued to be freely supplied with blood, and was even rather warmer than the opposite arm; that the operation, which was severe from the length of time it took up, was after a time followed by considerable indisposition; that the patient died about five days after its performance; that, after the artery had been tied, the œdema of the arm, and the aneurismal tumour partly subsided; and, that, on examination after death, nothing, but the vessel, was found included in the ligature.

The case, in my opinion, does Mr. Ramsden great honor; for, the difficulty he had to encounter in conveying the ligature under the artery was such as would have baffled all men of ordinary manual dexterity. In this gentleman's publication are descriptions of instruments, which will be of great service to any future performer of this operation. The chief one is a needle, resembling that, which was invented and used by Desault, and of which I have already endeavoured to give an idea. By means of this instrument, I conceive, that the main difficulty of the operation will for the future be no longer experienced. Had Mr. Ramsden had its assistance, his patient would have been detained a very little time in the operating theatre, and the event of the case might have been completely successful. Having witnessed all the circumstances of the case, the inference, that I drew from them was, that, if the operation could have been done in a moderate time, which now seems practicable with the aid of the aiguille à ressort, the case in all probability would have ended well. The preceding case is particularly memorable, as being the first instance, in which the subclavian artery has been scientifically tied, without any random thrust of a needle, and without the inclusion of any part besides the artery in the ligature. It is a fact, that furnishes an encouragement to repeat the experiment, holds out the hope, that axillary aneurisms may hereafter be cured as well as inguinal ones; and confirms the competency of the anastomosing arteries to nourish the whole upper extremity, when the subclavian is tied where it emerges from behind the anterior scalenus muscle.

In the year 1811 the subclavian artery was tied in the London Hospital, in a case of axillary aneurism. Sir W. Blizard found no difficulty in getting the ligature under the artery, with a common aneurism needle. A single ligature was applied. At first, hopes of recovery were entertained; but the patient afterwards sunk, and died on the fourth day. He was an old debilitated subject. (See *Hodgson's Treatise, p.* 375.)

It has been proposed to tie the arteria innominata in cases of aneurism of the subclavian artery. From a variety of facts specified by a late interesting writer, it seems probable, that the brain and arm would receive an adequate supply of blood, although the arteria innominata were obliterated. On the whole, however, we fully coincide with Mr. Hodgson in condemning the proposal. The chief objections to it arise from the difficulty of the operation in the living subject; from the inflammation likely to be thereby excited amongst the important neighbouring parts; from the danger of hemorrhage, in consequence of the adhesion of the vessel being likely to be broken by the force of the circulation; and, lastly, from the equal practicableness of tying the subclavian artery, in most cases on the tracheal side of the scalenus. (See *Hodgson's Treatise on Diseases of Arteries, p.* 384.)

### CAROTID ANEURISMS.

There is no part of the body, where the diagnosis of aneurisms, is more liable to mistake, than in the neck. Here the disease is particularly apt to be confounded with tumors of another nature. We have already cited in this article examples, in which aneurisms of the arch of the aorta so resembled those of the carotid, as to have deceived the surgeon, who was consulted. The swelling of the lymphatic glands, or of the cellular substance which surrounds the carotid artery; the enlargement of the thyroid gland; and especially abscesses, may resemble an aneurism by the pulsations, communicated to them by the neighbouring artery. On the other hand, aneurisms of long standing, which no longer throb, and the integuments over which are changed in color, and likely to burst, may the more easily be mistaken by an inattentive practitioner for chronic abscesses, as the neck is remarkably often the seat of such diseases. (*Boyer, Traité des Maladies Chirurgicales, T.* 2, *P.* 185.)

I need scarcely observe, that by opening a carotid aneurism, a surgeon would expose himself to the disgrace and mortification of seeing the patient die under his hands, as happened in the example cited by Harderus. (*Apiar. Observationum, Obs.* 86.)

The possibility of tying the carotid artery, in cases of wounds and aneurisms, without any injurious effect on the functions of the brain, now seems completely proved. Petit mentions, that the advocate Vieillard, had an aneurism at the bifurcation of the right carotid, for the cure of which he was ordered a very spare diet, and directed to avoid all violent exercise. Three months after this prescription, the tumour had evidently diminished; and, at last, it was converted into a small, hard, oblong, knot, without any pulsation. The patient having died of apoplexy, the right carotid was found closed up and obliterated, from its bifurcation, as low down as the right subclavian artery.—(*Acad. des Sciences de Paris, an.* 1765.) Hebenstreit, vol. 5, of his Translation of B. Bell's Surgery, mentions a case, in which the carotid artery was wounded, in extirpating a scirrhous tumour. The hemorrhage would have been fatal, had not the surgeon immediately tied the trunk of the vessel. The patient lived many years afterwards.

Dr. Baillie knew an instance, in which one carotid was entirely obstructed, and the diameter of the other considerably lessened, without any apparent ill effects on the brain. (See *Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol.* 1. *p.* 121.) Mr. Astley Cooper has also recorded an example, in which the left carotid was obstructed by the pressure of an aneurism of the aorta. (See *Medico-Chirurgical Transactions, Vol.* 1. *p.* 223.)

Mr. Abernethy was under the necessity of tying the trunk of the carotid, in the case of a large, lacerated wound of the neck, in which accident the internal carotid, and all the branches in front of the external one, were wounded. The patient seemed to be going on very well at first, but in the night he became delirious and convulsed, and died about thirty hours after the ligature was applied. Mr. A. considers the delirium and the inflammatory appearance found on the brain, on opening the body, as effects of stopping the supply of blood to the brain. I was a spectator of this interesting case, and, with due deference to Mr. Abernethy, cannot help thinking, especially when the above facts press on my mind, that the delirium might more properly be regarded as the consequence of so terrible a lacerated wound as this poor man received. Stopping the flow of blood to a part, has always been considered a chief means of averting inflammation of it, not bringing it on.

That the carotid may be tied without injuring the functions of the brain, and that aneurisms of this artery admit of being cured by the operation, is now fully proved.

In the following case which fell under my own observation, the intellectual faculties were not impaired by the great change, which must happen in respect to the supply of blood to so important an organ.

A soldier of the 44th regiment was wounded in the neck, with a pike, at the battle of Waterloo, and was brought to Brussels. After he had been some little time in the hospital, the bleeding, which had taken place previously and stopped, recurred from time to time with great violence, both from the mouth and the external wound itself. In short, it became necessary to tie the common carotid, which was done by staff surgeon Collier. The operation was performed by making an incision along the inner edge of the sterno-cleido-mastoideus, raising this muscle from the sheath including the artery, &c. and holding aside the jugular and lower thyroid veins which swelled up every instant to a very large size, so as to overlap the artery. This vessel being disengaged from the nerve was then tied. Though the operation was done by candlelight, it was most skilfully performed, and reflects great credit on Mr. Collier, whose zeal in his profession cannot be surpassed.

On Friday, Nov. 1, 1805, Mr. Astley Cooper operated on Mary Edwards, aged 44, who had an aneurism of the right carotid artery. At this time, the tumour reached from near the chin to beyond the angle of the jaw, and downward to within two inches and a half from the clavicle.

The swelling had a strong pulsatory motion. The woman also complained of a particular tenderness of the scalp on the same side of the head, and of such a throbbing in the brain as prevented her from sleeping.

An incision, two inches long, was made on the inner edge of the sterno-cleido-mastoideus muscle, from the lower part of the tumour to the clavicle. This wound exposed the omo-hyoideus, and sterno-hyoideus muscles, which being drawn aside towards the trachea, the jugular vein presented itself to view. The motion of this vein produced the only difficulty in the operation, as, under the different states of breathing, the vessel sometimes became tense and distended before the knife, and then suddenly collapsed. Mr. Astley Cooper introduced his finger into the wound to keep the vein out of the way of the knife, and, having exposed the carotid artery by another cut, he passed two ligatures under this vessel by means of a curved aneurism-needle. Care was taken to exclude the recurrent nerve on the one hand, and the par vagum on the other. The ligatures were then tied about half an inch asunder; but, the intervening portion of the artery was left undivided.

The pulsation of the swelling ceased immediately the vessel was tied, and, on the day after the operation, the throbbing in the brain had subsided, while no diminution of nervous energy in any part of the body could be observed.

The patient was occasionally afflicted with bad fits of coughing; but, upon the whole went on at first pretty well. On the eighth day, however, a paralysis of the left leg, and arm was noticed, attended with a great deal of constitutional irritation. Nov. 8th, the patient could move her arm rather better; but, became unable to swallow solids. Nov. 12th, the palsy of her arm had now almost disappeared. The ligatures came away. Nov. 14th, the woman was in every respect better; she swallowed with less difficulty; the tumour was smaller, and quite free from pain. On the 17th, she became very ill; the tumour increased in size, and was sore when pressed. The wound was as large as immediately after the operation, and discharged a sanious serum. Great difficulty of swallowing, and a most distressing cough, were also experienced. The pulse was ninety-six, and the left arm again very weak. On the 21st, the patient died, the difficulty of swallowing having previously become still greater, attended with a further increase of the tumour, the skin over which had acquired a brownish red colour.

On opening the swelling after death, the aneurismal sac was found inflamed, and the clot of blood in it was surrounded with a considerable quantity of pus. The inflammation extended on the outside of the sac, along the par vagum, nearly to the basis of the skull. The glottis was almost closed, and the lining of the trachea was inflamed and covered with coagulating lymph. The pharynx was so compressed by the tumour, which had suddenly become much enlarged by the inflammation, that a bougie, of the size of a goose-quill, could hardly be introduced into the œsophagus. Mr. Astley Cooper concludes with expressing his opinion, that these causes of the fatal event might in future be avoided by operating before the tumour is of such size as to make pressure on important parts; or, if the swelling should be large, by opening it, and letting out its contents, as soon as inflammation comes on. (See *Medico-Chirurgical Transactions, Vol.* 1.)

Mr. Cline operated for a carotid aneurism, Dec. 16, 1808, in St. Thomas's Hospital. The tumour was very large, and had increased with great rapidity. The pressure of the swelling was such as to interrupt both respiration and deglutition, and to put the larynx out of its natural position. The patient had besides a frequent and troublesome cough. The pain was confined to the tumour and same side of the face.

These symptoms seemed relieved during the first twelve hours after the operation. They then became worse, particularly the cough and difficulty of breathing, and a violent irritative fever took place. The man died on the 19th of the same month. (See *London Medical Review, No.* 3.)

In the month of June 1808, Mr. Astley Cooper operated, in Guy's Hospital, on a man, aged 50, who had a carotid aneurism, attended with pain on one side of the head, throbbing in the brain, hoarseness, cough, slight difficulty of breathing, nausea, giddiness, &c. The patient got quite well, and resumed his occupation as a porter. The facial and temporal arteries of the aneurismal side of the face afterwards had no perceptible pulsation.

On the opposite side the temporal artery became unusually large. The tumour was at last quite absorbed, though a pulsation existed in it till the beginning of September. The man's intellects remained perfect; his nervous system was unaffected; and the severe pain, which, before the operation used to affect the aneurismal side of the head, never returned.

The swelling, at the time of the operation, was about as large as a pullet's egg, and situated on the left side about the acute angle, made by the bifurcation of the common carotid, just under the angle of the jaw.

Mr. Astley Cooper began the incision opposite the middle of the thyroid cartilage, at the base of the tumour, and extended the wound to within an inch of the clavicle, on the inner side of the sterno-cleido-mastoideus muscle. On raising the margin of this muscle, the omo-hyoideus could be distinctly seen crossing the sheath of the vessels, and the nervous descendens noni was also brought into view. The sterno-cleido-mastoideus was now separated from the omo-hyoideus, when the jugular vein was seen. This vessel became so distended at every expiration as to cover the artery. When the vein was drawn to one side, the par vagum was manifest, lying between this latter vessel and the carotid artery, but a little to the outer side of the artery. The nerve was easily avoided.

A double ligature was then conveyed under the artery with a blunt iron probe. The lower ligature was immediately tied, and the upper one was also drawn tight, as soon as about an inch of the artery had been separated from the surrounding parts above the first ligature, so as to allow the second to be tied at this height. A needle and thread were passed through the vessel below one ligature, and above the other. The artery was then divided. In a little more than nine weeks, the wound was quite healed, and the patient entirely recovered. (See *Medico-Chirurg. Transact. Vol.* 1.)

Another successful instance, in which the carotid was tied for the cure of an aneurism, is related in a work, to which I always have the greatest pleasure in referring. (See *Hodgson's Treatise on the Diseases of Arteries, p.* 329.)

Mr. Travers, surgeon to St. Thomas's Hospital, tied the carotid artery in a woman, who had an aneurism by anastomosis in the left orbit. The disease had pushed the eye out of its socket. Two small ligatures were applied, which came away on the twenty-first and twenty-second day. No hemorrhage, nor impairment of the functions of the brain took place, and the disease in the orbit was effectually cured. (See *Medico-Chirurgical Transactions, Vol.* 2, *part* 1. *and the London Medical Review, No.* 7.)

Another highly interesting example, in which an aneurism by anastomosis in the orbit, was effectually cured by tying the carotid artery, is recorded by Mr. Dalrymple, surgeon at Norwich. This gentleman performed the operation on the 12th of November, 1812. The patient was a female aged 44. The protrusion of the eye was relieved in proportion as the swelling diminished. The violent headachs also subsided; but the eyesight was irrecoverably lost. (See *Medico-Chirurgical Trans. Vol.* 6. *p.* 111.)

In order to get at the carotid artery in the safest manner, Mr. Abernethy has recommended making an incision on that side of it which is next the trachea, where no important parts are exposed to injury, and then to pass a finger underneath the vessel. The par vagum must be carefully excluded from the ligature; for, to tie it would be fatal. (*Surgical Observations,* 1804.)

## ANEURISMAL VARIX, OR VENOUS ANEURISM.

The seat of this tumour is, in general, in the basilic vein, which is enlarged, so as to form an oblong swelling, in the middle of which is the scar, made by the lancet in bleeding. The tumour seldom extends more than two inches above and below the injury; beyond this distance the vein regains its natural size.

Dr. W. Hunter is undoubtedly the first who gave an accurate description of this disease, although Professor Scarpa is disposed to claim a share of the merit for his own countryman Guattani, who, about the same time when Dr. Hunter wrote in the Medical Observations and Inquiries, published the history of two cases of aneurismal varix.

"Does it ever happen in surgery," says Dr. Hunter, "that when an artery is opened through a vein, a communication, or anastomosis, is afterwards kept up between these two vessels? It is easy to conceive this case, and it is not long, since I was consulted about one, that had all the symptoms that might be expected, supposing such a thing to have actually happened, and such symptoms, as otherwise must be allowed to be very unaccountable. It arose from bleeding; and was of some years standing, when I saw it about two years ago, and I understand very little alteration has happened to it since that time. The veins, at the bending of the arm, and especially the basilic, which was the vein that had been opened, were there prodigiously enlarged, and came gradually to their naturally size, at about two inches above, and as much below the elbow. When emptied by pressure, they filled again almost instantaneously, and this happened, even when a ligature was applied tight round the forearm, immediately below the affected part. Both when the ligature was made tight, and when it was removed, they shrunk, and remained of a small size, while the finger was kept tight upon the artery, at the part where the vein had been opened in bleeding. There was a general swelling in the place, and in the direction of the artery, which seemed larger, and beat stronger, than what is natural, and there was a tremulous jarring motion in the vein, which was strongest at the part, which had been punctured, and became insensible at some distance both upwards and downwards." (*Medical Observations and Inquiries, Vol.* 1.)

In the second volume of this work, Dr. Hunter adds some further remarks on the aneurismal varix.

"In the operation of bleeding, the lancet is plunged into the artery through both sides of the vein, and there will be three wounds made in these vessels, viz. two in the vein, and one in the artery, and these will be nearly opposite to one another, and to the wound in the skin. This is what all surgeons know has often happened in bleeding, and the injury done the artery is commonly known by the jerking impetuosity of the stream, whilst it flows from the vein, and by the difficulty of stopping it, when a sufficient quantity is drawn."

"In the next place, we must suppose, that the wound of the skin, and of the adjacent, or upper side of the vein, heal up as usual; but, that the wound of the artery, and of the adjacent, or under side of the vein, remain open, (as the wound of the artery does in the spurious aneurism) and, by that means, the blood is thrown from the trunk of the artery, directly into the trunk of the vein. Extraordinary as this supposition may appear, in reality it differs from the common spurious aneurism in one circumstance only, viz. the wound remaining open in the side of the vein, as well as in the side of the artery. But this one circumstance will occasion a great deal of difference in the symptoms, in the tendency of the complaint, and in the proper method of treating it: upon which account the knowledge of such a case will be of importance in surgery."

"It will differ in its symptoms from the common spurious aneurism principally thus. The vein will be dilated, or become varicose, and it will have a pulsating jarring motion on account of the stream from the artery. It will make a hissing noise, which will be found to correspond with the pulse for the same reason. The blood of the tumour will be altogether, or almost entirely fluid, because kept in constant motion. The artery, I apprehend, will become larger in the arm, and smaller at the wrist, than it was in the natural state; which will be found out by comparing the size, and the pulse, of the artery in both arms, at these different places. The reason of which I shall speak of hereafter. And the effects of ligatures, and of pressure upon the vessels above the elbow and below it, will be what every person may readily conceive, who understands any thing of the nature of arteries and veins in the living body."

"The natural tendency of such a complaint will be very different from that of the spurious aneurism. The one is growing worse every hour, because of the resistance to the arterial blood, and if not remedied by surgery must at last burst. The other, in a short time, comes to a nearly permanent state; and, if not disturbed, produces no mischief, because there is no considerable resistance to the blood, that is forced out of the artery."

"The proper treatment must, therefore, be very different in these two cases, the spurious aneurism requiring chirurgical assistance, as much, perhaps, as any disease whatever; whereas, in the other case, I presume it will be best to do nothing."

"If such cases do happen, they will no doubt be found to differ among themselves, in many little circumstances, and particularly in the shape, &c. of the tumefied parts. Thus the dilatation of the veins may be in one only, or in several, and may extend lower, or higher, in one case, than in another, &c. according to the manner of branching, and to the state of the valves in different arms. And the dilatation of the veins may, also, vary, on account of the size of the artery, that is wounded, and of the size of the orifice in the artery and in the vein."

" Another difference in such cases will arise from the different manner, in which the orifice of the artery may be united or continued with the orifice of the vein. In one case, the trunk of the vein may keep close to the trunk of the artery, and the very thin stratum of cellular membrane between them, may, by means of a little inflammation and coagulation of the blood among its filaments, as it were solder the two orifices of these vessels together, so that there shall be nothing like a canal going from one to the other; and then the whole tumefaction will be more regular, and more evidently a dilatation of the veins only. In other instances the blood, that rushes from the wounded artery, meeting with some difficulty of admission and passage through the vein, may dilate the cellular membrane, between the artery and vein, into a bag, as in a common spurious aneurism, and so make a sort of canal between these two vessels. The trunk of the vein will then be removed to some distance from the trunk of the artery, and the bag will be situated chiefly upon the under side of the vein. The bag may take on an irregular form, from the cellular membrane being more loose, and yielding, at one place, than at another, and from being unequally bound down by the fascia of the biceps muscle. And if the bag be very large, especially, if it be of an irregular figure, no doubt, coagulations of blood may be formed, as in the common spurious aneurism."

After relating two cases, very illustrative of the nature of the aneurismal varix, Dr. W. Hunter proceeds to enquire: " Why is the pulse at the wrist, so much weaker in the diseased arm, than in the other; surely, the reason is obvious and clear. If the blood can easily escape from the trunk of the artery directly into the trunk of the vein, it is natural to think, that it will be driven along the extreme branches with less force, and in less quantity."

2. " Whence is it, that the artery is enlarged all the way down the arm? I am of opinion, that it is the consequence of the blood passing so readily from the artery into the vein, and is such an extension, as happens to all arteries, in growing bodies, and to the arteries of particular parts, when the parts themselves increase in their bulk, and, at the same time, retain a vascular structure. It is well known, that the arteries of the uterus grow much larger in the time of utero-gestation. I once saw a fleshy tumour upon the top of a man's head, as large nearly as his head; and his temporal and occipital arteries, which fed the tumour, were enlarged in proportion. I have observed the same change in the arteries of enlarged spleens, testes, &c. so that I should suppose it will be found to be universally true in fact, and the reason of it in theory seems evident." (See *Medical Observations and Inquiries, vol.* 2.)

In thin subjects, the median basilic vein is so close to the brachial artery, the track of which it crosses at a very acute angle, that it is almost impossible to open it at this point, without risk of wounding the artery at the same time. The bend of the arm is also the only situation, in which this disease has yet been well noticed. It is easy to conceive, however, that the venous aneurism may happen wherever an artery of a certain diameter lies immediately under a vein. Thus, M. Larrey, an eminent surgeon at Toulouse, met with a venous aneurism in the ham caused by a sword-wound of the popliteal artery and vein. (*Boyer, Traité des Maladies Chirurgicales, &c. T.* 2, *p.* 177.) Two cases are likewise recorded by Mr. Hodgson. In one the disease was caused in the thigh, about four inches below Poupart's ligament, by the point of a heated iron rod, which had passed through the femoral artery and vein. In the other example, the aneurismal varix was situated in the ham, and was the consequence of a wound in that part with a pistol ball. (*Treatise on the Diseases of Arteries, p.* 498.) According to Richerand, M. Larrey shewed to the Faculty of Medicine a grenadier, in whom this disease was situated underneath the clavicle, and had been produced by a wound of the great artery and vein in that situation. (*Dictionnaire des Sciences Medicales, art. Aneurisme Variqueux.*)

Professor Scarpa, Dr. Hunter, Mr. B. Bell, Pott, and Garneri, mention cases of the aneurismal varix, which remained stationary for fourteen, twenty, and thirty-five years. Several cases are related by Brambilla, Guattani, and Monteggia, of a cure having been obtained by means of compression. But, as this method of cure, if it does not succeed, exposes the patient to the danger of a complication of the disease with an aneurism, it ought not to be employed, except in recent cases, where the tumour is small, and in slender patients, at an early period of life, and where both of the vessels can be compressed accurately against the bone. If the disease is complicated with an aneurism, which threatens to become diffused, we are under the necessity of having recourse to an operation. (*Scarpa on Anatomy, &c. of Aneurism.*)

There are two cases recorded, in which it was necessary to operate in consequence of the disease being joined with aneurism of the artery, and even bursting. The sacs were opened, and a ligature applied both above and below the aperture in the artery. (See *Medical Facts and Obs. Vol.* 4. *p.* 111, and *Medical Museum, Vol.* 1. *p.* 65.)

### ANEURISM FROM ANASTOMOSIS.

This is the term which Mr. John Bell, of Edinburgh, has given to a species of aneurism, which resembles such bloody tumours, (*nævi materni*) as appear in new-born children, grow to a large size, and, ultimately bursting, emit a considerable quantity of blood.

We find clear descriptions of this disease in writers, though before the publication of Mr. John Bell's Principles of Surgery, it was not classed with aneurisms. Thus, Desault has recorded a case of this affection, for the express purpose of proving, that pulsation is an uncertain sign of the existence of an aneurism. (See *Parisian Chirurgical Journal, Vol. 2, p. 73.*)

The aneurism from anastomosis often affects adults, increasing from an appearance like that of a mere speck, or pimple, to a formidable disease, and being composed of a mutual enlargement of the smaller arteries and veins. The disease originates from some accidental cause; is marked by a perpetual throbbing; grows slowly, but incontrollably; and is rather irritated, than checked, by compression. The throbbing is at first indistinct, but when the tumour is perfectly formed, the pulsation is very manifest. Every exertion makes the throbbing more evident. The occasional turgid states of the tumor produce sacs of blood in the cellular substance, or dilated veins, and these sacs form little tender, livid, very thin, points, which burst, from time to time, and then, like other aneurisms, this one bleeds so profusely, as to induce extreme weakness.

The tumor is a congeries of active vessels, and the cellular substance, through which these vessels are expanded, resembles, as Mr. John Bell describes, the gills of a turkey cock, or the substance of the placenta, spleen, or womb. The irritated and incessant action of the arteries fills the cells with blood, and from these cells, it is reabsorbed by the veins. The size of the swelling is increased by exercise, drinking, emotions of the mind, and by all causes which accelerate the circulation.

The hemorrhage from the aneurism by anastomosis sometimes usurps, in the female subject, the place of menstruation, as the following example illustrates.

Ann Vachot, of St. Maury, in Bresse, was born with a tumour on her chin, of the size and shape of a small strawberry, without pain, heat, or discoloration of the skin. As it produced no uneasiness, nor inconvenience whatever, it excited little attention, particularly as it did not seem to increase with the growth of the child. For the first fifteen years, there was but little alteration; but, about the menstrual period, it increased suddenly to double the size, and became more elongated in its form. A quantity of red blood was observed to ooze from its extremity. This flux became, in some measure, periodical, and sometimes was sufficiently abundant to produce an alarming degree of weakness. Each period of its return was preceded by a violent pain in the head and numbness.

Before and after the appearance of these symptoms, there was no alteration in the size of the tumour; the only difference was a small enlargement of the cutaneous veins, with an increase of heat in the part, occasioning some degree of tenderness.

The menses at length took place, but, in small quantity, and, at irregular periods, without influencing the blood discharged from the tumour, or the frequency of the evacuation.

The breasts were not enlarged till a late period, nor did the approach of puberty seem to have its accustomed influence on those glands, &c. (See *Parisian Chirurgical Journal, Vol. 2, p. 73, 74.*)

"This aneurism, (observes Mr. John Bell,) is a mere congeries of active vessels, which will not be cured by opening it; all attempts to obliterate the disease with caustics, after a simple incision, have proved unsuccessful, nor does the interrupting of particular vessels, which lead to it, affect the tumour; the whole group of vessels must be extirpated. In varicose veins, or in aneurisms of individual arteries, or in extravasations of blood, such as that produced under the scalp from blows upon the temporal artery, or in those aneurisms, produced in schoolboys by pulling the hair, and, also, in those bloody effusions from blows on the head, which have a distinct pulsation, the process of cutting up the varix, aneurism, or extravasation, enables you to obliterate the vessel and perform an easy cure. But, in this enlargement of innumerable small vessels, in this aneurism by anastomosis, the rule is 'not to cut into, but to cut it out.' These purple and ill-looking tumours, because they are large, beating, painful, covered with scabs, and bleeding, like a cancer in the last stage of ulceration, have been but too often pronounced cancers! incurable bleeding cancers! and the remarks, which I have made, while they tend, in some measure, to explain the nature and consequences of the disease, will remind you of various unhappy cases, where either partial incisions only had been practised, or the patient left entirely to his fate." (See *John Bell's Principles of Surgery, Vol. 1.*)

In the section on carotid aneurisms, I have mentioned the cases, in which Mr. Travers and Mr. Dalrymple cured aneurisms by anastomosis in the orbit, by tying the common carotid artery. These facts confirm, that the aneurism by anastomosis, like many other diseases, admits of being cured on the principle of cutting off, or lessening, the supply of blood to the part affected.

For information on aneurism, consult *Lauth's Scriptores Latini de Aneurismatibus, which work contains Asman's Dissertatio Medica Inauguralis de Aneurismate; Guattani, de Externis Aneurysmatibus; Lancisi de Aneurysmatibus. Opus Posthumum; Matani de Aneurysmaticis Præcordiorum Morbis Animadversiones; Verbrugge, Dissertatio Anatomico Chirurgica de Aneurysmate; Wetinus Dissertatio Inauguralis Medica de Aneurysmate Vero Pectoris Externo Hemiplegiæ Sobole; Murray, Observationes in Aneurismata Femoris; Trew, Aneurysmatis Spurii Post Venæ Basilicæ Sectionem Orti, Historia et Curatio. See also an account of Mr. Hunter's Method of performing the Operation for the Cure of the Popliteal Aneurism, by E. Home, in the Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol.* 1, *p.* 138, *and Vol.* 2, *p.* 235. *Sabatier's Médecine Opératoire, Tom.* 3. *The several volumes of the Medico-Chirurgical Transactions. Cases in Surgery by J. Warner, p.* 141, *&c. Edit.* 4. *Richerand's Nosographie Chirurgicale, Tom.* 4. *Pelletan's Clinique Chirurgicale, Tom.* 1 *and* 2. *A. Burn's Surgical Anatomy of the Head and Neck. Ramsden's Practical Observations on the Sclerocele, with four cases of operations for aneurism. Œuvres Chirurgicales de Desault par Bichat, Tom.* 2, *p.* 553. *Wells in Transactions of a Society for the Improvement of Med. and Chirurg. Knowledge, Vol.* 3, *p.* 81—85, *&c. Corvisart, Essai sur les Maladies et les Lesions Organiques du Cœur et des Gros Vaisseaux. Edit.* 2. *C. Bell's Operative Surgery, Vol.* 1. *John Bell's Principles of Surgery, Vol.* 1. *Richter's Anfangsgrunde der Wundarzneykunst, Band* 1. *Abernethy's Surgical Works. Monro's Observ. in the Edinb. Med. Essays. Various productions in the Med. Observ. and Inquiries. The article Aneurism in Rees's Cyclopædia. Freer's Observations on Aneurism,* 1807; *and a Treatise on the Anatomy, Pathology, and Surgical Treatment of Aneurism by A. Scarpa, translated by J. H. Wishart,* 1808. *The original Italian was published* 1804. *Callisen's Systema Chirurgiæ Hodiernæ, Part* 2, *p.* 545, *&c. Edit.* 1798. *Boyer's Traité des Maladies Chirurgicales, &c. T.* 2, *p.* 84, *&c. Hodgson on the Diseases of Arteries and Veins, London,* 1815, *a work of the greatest accuracy and merit. Roux, Nouveaux Elemens de Médecine Opératoire, T.* 1. *Also, Roux Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Française, p.* 248, *&c. Paris,* 1815. *Burns on Diseases of the Heart. Lassus Pathologie Chirurgicale, Tom.* 1, *p.* 347, *&c. Léveillé Nouvelle Doctrine Chirurgicale, T.* 4, *p.* 213, *&c.*

**ANODYNES**, (from *α* neg. and *ῶδυνη*, pain.) Medicines are so termed, which diminish, or remove, pain, and they are indicated in surgery in all cases, in which it is desirable to relieve any intense pain. Opium is the principal one deserving confidence.

**ANTHRACOSIS**, (from *ανθραξ*, a burning coal.) A red, livid, burning, sloughy, very painful tumour, occurring on the eyelids. At first, antiphlogistic means are proper; but the grand thing is to make a free and early opening for the discharge of the matter contained in the swelling. The eye-lids and eye should be bathed with a collyrium, and kept cool with the saturnine lotion.

**ANTHRAX**, (*ανθραξ*, a burning coal.) See *Carbuncle.*

**ANTIMONIUM CALCINATUM,**—or PULVIS ANTIMONIALIS. (Supposed to be very similar to James's Powder.) Is now called the antimonial powder. In all cases of surgery, in which it is desirable to promote the secretions in general, and those of urine, perspiration, and of the alimentary canal, in particular, it is proper to have recourse to this important preparation. In all inflammations of the brain and its membranes, and, in every instance, in which there exists an inflammation of a viscus of high importance in the system, antimony should be exhibited, and, in general, the antimonial powder is as eligible a prescription as any. For an adult, four or five grains may be ordered, and the dose, if requisite, may be repeated, three or four times a day.

**ANTIMONIUM MURIATUM.** This has often been named, *butter of antimony*, and is employed in surgery as a caustic.

**ANTIMONIUM TARTARIZATUM,** (*Emetic Tartar.*) This medicine is well known as the most common emetic. For this purpose, it may be given in either of the following ways, as the indications of the case may demand. ℞. Antimonii Tart. gr. ij. Aq. distil. ℥iv. Misce et cola. Dosis ℥ij. pro emetico ; vel ℥ss quadrante quoque horæ, donec supervenerit vomitus.

If tartarised antimony be exhibited merely to excite a diaphorœsis, half an ounce, or one table spoonful, of the above mixture is to be given once every six hours.

This preparation is very much employed by the best continental surgeons, for increasing the gastric secretions, and maintaining, for a length of time, a lax state of the bowels. We shall have occasion to notice its efficacy in the cure of numerous surgical diseases, particularly *Amaurosis, Erysipelas, Injuries of the Head, &c.*

**ANTIPHLOGISTICS**, (from *αντι*, against, and *φλεγῶ*, to burn.) All means are so termed, which have a tendency to subdue inflammation. (See *Inflammation.*)

The first of these, to which the surgeon should direct his attention, when he wishes to cure an inflammatory affection, is to remove, as far as it is in his power, the occasional cause. Extraneous bodies, lodged in parts, and producing inflammation by their mechanical operation, should be extracted as soon as possible, if their particular situation, shape, &c. will admit of it. The removal of substances, which irritate by their chemical properties, is difficult, and sometimes impracticable.

On account of their great activity, however, it is necessary to oppose their effects, without loss of time. This is accomplished, in a certain degree, by diluting such substances with aqueous fluids, defending the parts from their action by oily and sedative applications; and, by correcting their specific irritation by means of other substances, which have a particular affinity to them.

Antiphlogistic remedies, properly so called, are divided into *general*, by which are meant such as affect the whole system; and into *topical*, the operation of which is, at least, for a certain time, entirely local and circumscribed.

*General Antiphlogistics are:* 1. Bleeding. (See this word.)

2. Glysters, and gentle laxative medicines. The most active cathartics may sometimes be considered in the same light; but, there are many inflammations, in which the effect of strong purgatives is hurtful and dangerous. Such are, in particular, all instances, in which there is inflammation of the thoracic, and abdominal viscera.

3. Aqueous diluting beverages, taken in large quantities.

4. The warm bath.

5. Cooling medicines, such as acid drinks, saline draughts, and some of the neutral salts, such as nitre, the ammonia muriata, aq. ammon. acet. &c.

6. Anodynes, especially opium, only to be given, however, under the circumstances, and in the way, to be noticed in the article, *Inflammation.*

With these direct means of diminishing the action of the sanguiferous system, we must combine a more, or less complete abstinence from all solid animal food. Too warm an atmosphere should also be avoided, as well as all stimulants whatever, every kind of noise, every thing likely to alarm, or disturb the mind, &c.

*Topical antiphlogistics* are: 1. Local bleeding practised by means of leeches, scarifications, or cupping.

2. Emollient poultices, which are proper, when the inflammation is accompanied with an extraordinary degree of pain and hardness, and, especially, when it is disposed to suppurate. The best emollient poultice is that of linseed, described in the article *Inflammation.* Some use the one made of bread and milk; some disliking milk, in consequence of its inutility, and its tendency to turn sour, only use water: while others make the bread into a poultice by softening it, and beating it up, with Goulard's lotion.

3. Discutients are particularly used in all cases, in which the inflammation is less acute, and seems to have no tendency to suppurate. Cold water, various preparations containing lead, a solution of sal ammoniac in vinegar and water, spirit of wine, vinegar, æther, the various infusions of bitter aromatic plants, and the decoction of bark, are very good discutient remedies.

4. The maintenance of a continual evaporation from the surface of the inflamed part, by applying folded linen, wet with the lotio aq. litharg. acet. cold water, a solution of zincum vitriolatum, &c. Spirits, æther, snow, or powdered ice, produce more cold, and, are sometimes, though not very commonly, made use of. This is the ordinary principle, on which surgeons conduct the local treatment of phlegmonous inflammation, when there is the prospect of avoiding the formation of an abscess.

5. Fomentations. These are prepared by dipping flannels in some warm liquor, squeezing a certain quantity of fluid out of them, and then placing them quite warm on the inflamed part. They are mostly used in cases, in which emollient poultices are the permanent local applications, and when the patient suffers extraordinary pain. A decoction of white poppy heads, or camomile flowers, is the liquor commonly employed. Fomentations are very temporary means, being only applied in general, about half an hour, two, or three times a day. The best opportunity of doing this, is when the poultice is to be changed.

6. Among the means, essential to an antiphlogistic regimen, perfect quietude, both of body and mind, is not the least important. (See *Inflammation.*) *Encyclopédie Méthodique; Partie Chirurgicale.*

**ANTISEPTICS,** (from αντι, against, and σηπω, to putrefy.) Remedies, supposed to have the virtue of resisting the tendency to putrefaction.

**ANTRUM,** Diseases of. The antra are liable to a variety of diseases. Sometimes, their membranous lining inflames, and secretes pus. At other times, in consequence of inflammation, or other causes, various excrescences and fungi are produced in them. Their bony parietes are occasionally affected with exostosis, or caries. Extraneous bodies may be lodged in them, and, it is even asserted, that insects may be generated there, and cause, for many years, very afflicting pains.

### ABSCESSES IN THE ANTRUM.

Of all the above cases, this is by far the most common. Violent blows on the cheeks, inflammatory affections of the adjacent parts, and, especially, of the pituitary membrane lining the nostrils, exposure to cold and damp, and, above all things, bad teeth, may induce inflammation and suppuration in the antrum. The first symptom is a pain, at first imagined to be a tooth-ach, particularly if there should be a carious tooth, at this part of the jaw. Such pain, however, extends more into the nose, than that usually does, which arises from a decayed tooth; it also affects, more or less, the eye, the orbit, and the situation of the frontal sinuses. But, even these symptoms are insufficient to characterize the disease, the nature of which is not unequivocally evinced, till a much later period. The complaint is, in general, of much longer duration, than one entirely dependent on a caries of a tooth, and its violence increases more and more, until, at last, a hard tumour becomes perceptible below the cheek bone. The swelling, by degrees, extends over the whole cheek: but, it afterwards rises to a point, and forms a very circumscribed hardness, which may be felt above the back grinders. This symptom is accompanied with redness, and sometimes with inflammation and suppuration of the external parts. It is not uncommon, also, for the outward abscess to communicate with that within the antrum.

The circumscribed elevation of the tumour, however, does not occur in all cases. There are instances in which the matter makes its way towards the palate, causing the bones of this part to swell, and, at length, rendering them carious, unless timely assistance be given. There are other cases, in which the matter escapes between the fangs and sockets of the teeth. Lastly, there are certain examples, in which matter, formed in the antrum, makes its exit at the nostril of the same side, when the patient is lying with his head on the opposite one, in a low position. If this mode of evacuation should be frequently repeated, it prevents the tumour, both from pointing externally, and bursting, as it would do if the purulent matter could find no other vent. But this evacuation of pus from the nostril is not very common; for, according to Mr. Hunter, the opening between the antrum and cavity of the nose, is generally stopped up. This celebrated anatomist even seems inclined to think, that the disease may sometimes be occasioned by the impervious state of this opening, in consequence of which obstruction, the natural mucus of the antrum may collect there in such quantity, as to irritate and inflame the membrane, with which it is in contact. This may happen in the same way as an obstruction in the ductus nasalis hinders the passage of the tears into the nose, and causes an abscess in the lachrymal sac. (See *Natural History of the Human Teeth, &c. by John Hunter, p.* 174.) However, in the majority of cases, we may conclude, that the impervious state of the opening is rather an effect, than the cause, of the disease, since inflammation in the antrum is often manifestly produced by causes of a different kind, and since the opening in question is not invariably closed.

Abscesses in the antrum require a free exit for their contents, and, if the surgeon neglects to procure such opening, the bones become more and more distended and pushed out, and, finally, carious. When this happens, the pus makes its appearance, either towards the orbit, the alveoli, the palate, or, as is mostly the case, towards the cheek. The matter having thus made a way for its escape, the disease now becomes fistulous.

In all cases the principal indication is to discharge the matter, whether the pus is simply confined in the antrum, or whether the case be conjoined with a carious affection of the bones.

The ancients seem to have known very little of the treatment of diseases of the antrum. Drake, an English anatomist, is reputed to be the first proposer of a plan for curing abscesses of this cavity. Meibomius, however, had, a long while before him, proposed, with the same intention, to extract one or more of the teeth, in order that the matter might find an opening for its escape, through the sockets. This plan may be employed with success. The pus frequently has a tendency to make its way outward towards the teeth; it often affects their fangs; and, after their extraction, the whole of the abscess is seen to escape through the sockets. But this very simple plan will not suffice for all cases, as there are numerous instances, in which there is no communication between the alveoli and the antrum.

Drake, and, perhaps, before him, Cowper, took notice of the insufficiency of Meibomius's method, and, hence, they proposed making a perforation through the socket into the antrum with an awl, for the purpose of letting out the matter, and injecting into the cavity such fluids as were judged proper.

The extraction of one or more teeth, and the perforation of the alveoli, being essential steps in treating diseases of the antrum, we must consider what tooth ought to be taken out in preference to others.

A caries, or even a mere continual aching, of any particular tooth, in general ought to decide the choice. But, if all the teeth should be sound, which is not often the case, writers direct us to tap each of them gently, and to extract the one, which gives most pain on this being done. When no information can be thus obtained, other circumstances ought to guide us.

All the grinding teeth, except the first, correspond with the antrum. They even sometimes extend into this cavity, and the fangs are only covered by the pituitary membrane. The bony lamella, which separates the antrum from the alveoli, is very thin, towards the back part of the upper jaw. Hence, it is best, when the choice is in our power, to extract the third or fourth grinder, as, in this situation, the alveoli can be more easily perforated. Though, in general, the first grinder and canine tooth do not communicate with the antrum, yet, their fangs occasionally approach the side of this cavity.

When one or more teeth are carious, they should be removed, because they are both useless and hurtful. The matter frequently makes its escape, as soon as a tooth is extracted, in consequence of the fang having extended into the antrum, or rather in consequence of its bringing away with it a piece of the thin partition between it and the sinus. Perhaps a discharge may follow from the partition itself being carious. If the opening, thus produced, be sufficiently large to allow the matter to escape, the operation is already completed. But, as it can easily be enlarged, it ought always to be so when there is the least suspicion of its being too small. However, when no pus makes its appearance, after a tooth is extracted, the antrum must be opened by introducing a pointed instrument in the direction of the alveoli. Some use a small trocar, or awl; others a gimblet for this purpose.

The patient should sit on the ground, in a strong light, resting his head on the surgeon's knee, who is to sit behind him. Immediately the instrument has reached the cavity, it is to be withdrawn. Its entrance into the antrum is easily known by the cessation of resistance. After the matter is discharged, surgeons advise the opening to be stopped up with a wooden stopper, to keep victuals from getting into the antrum.

The stopper is to be taken out, several times a day, to allow the pus to escape. This plan soon disposes the parts affected to discontinue the suppuration, and resume their natural state. Sometimes, however, the pus continues to be discharged, for a long time after the operation, without any change occurring, in regard to its quality or quantity. In such instances, the cure may often be accelerated by employing injections of brandy and water, lime-water, or a solution of zincum vitriolatum.

Some surgeons prefer a silver cannula instead of the stopper, as it can always be left pervious except at meals.

If no opening were made in the antrum, the matter would make its way, sometimes towards the front of this cavity, which is very thin; sometimes, towards the mouth; and fistulous openings, and caries would inevitably follow.

When the bones are carious, the above plan will not accomplish a cure, until the affected pieces of bone exfoliate. A probe will generally enable us to detect any caries in the antrum. The fetid smell, and ichorous appearance of the discharge, also, leave little doubt that the bones are diseased; and, in proportion as the bones free themselves of any dead portions, the discharge has less smell, and its consistence becomes thicker.

There are cases, in which there are loose pieces of dead bone to be extracted, and, in which it is requisite to make a larger opening into the antrum, than can be obtained, at its lower part. Instances also occur, in which patients have lost all the grinding teeth, and the sockets are quite obliterated, so that a perforation from below could hardly be effected. Some practitioners have also objected to ever sacrificing a sound tooth. In these circumstances, it has been advised to make a perforation in the antrum, above the alveolary processes. M. Lamorier is the first who proposed this method. It consists in making a transverse incision, below the malar process, and above the root of the third grinder. Thus the gum and periosteum are divided, and the bone exposed. A perforating instrument is to be conveyed into the middle of this incision, and the opening in the antrum made as large as requisite. There are cases of very extensive exfoliations of the antrum, in which it is absolutely necessary to expose a great part of the surface of the bone, and to cut away the dead pieces which are wedged, as it were, in the living ones. A small trephine may sometimes be advantageously applied to the malar process of the superior maxillary bone.

Surgeons formerly treated carious affections of the antrum in the most absurd and unscientific way, introducing setons through its cavity, and even having recourse to the actual cautery. The moderns, however, are not much inclined to adopt this sort of practice. It is now known, that the detachment of a dead portion of bone, in other terms, the process of exfoliation, is nearly, if not entirely the work of nature, in which the surgeon can at most only act a very inferior part. Indeed, he should limit his interference to preventing the lodgment of matter, maintaining strict cleanliness, and removing the dead pieces of bone, as soon as they become loose. But, it is to be understood, that there are occasional examples, in which the dead portions of bone are so tedious of separation, and so wedged in the substance of the surrounding living bone, that an attempt may properly be made to cut them away.

### TUMOURS OF THE ANTRUM.

Ruysch, Bordenave, Desault, Abernethy, and many others, have recorded cases of polypous, fungous, and cancerous diseases of the antrum, and examples of this cavity being affected with exostosis.

The indolence of any ordinary fleshy tumour in the antrum, while in an incipient state, certainly tends to conceal its existence; but, such a disease rarely occurs without being accompanied with some affection of the neighbouring parts, and, hence, its presence may generally be ascertained before it has attained such a size as to have altered the conformation of the antrum. This information may be acquired by examining, whether any of the teeth have become loose, or have spontaneously fallen out; whether the alveolary processes are sound, and whether there are any fungous excrescences making their appearance at the sockets; whether there is any habitual bleeding from one side of the nose; any sarcomatous tumour at the side of the nostril, or towards the great angle of the eye. When the swelling has attained a certain size, the bony parietes of the antrum are always protruded outwards, unless the body of the tumour should be situated in the nostril, and only its root in the antrum. This case, however, is very uncommon.

As soon as a tumour is certainly known to exist in the antrum, the front part of this cavity should be opened, without waiting till the disease makes further progress. In a few instances, indeed, we may avail ourselves of the opening, which is sometimes found in the alveolary process, and enlarge it sufficiently to allow the tumour to be extirpated. If the front of the antrum were freely opened, it would in general be better to cut away the disease in its interior.

A swelling of the parietes of the antrum, in consequence of an abscess, or a sarcomatous tumour in its cavity, may lead us to suppose the case an enlargement of the bones, or an exostosis. The symptoms of the two first affections have been already detailed. A sign of an exostosis is, when besides the absence of the symptoms characterizing an abscess or a sarcoma, the thickened parietes of the antrum form a solid resistance; whereas, in cases of mere expansion, the dimensions of the surface of the bone being increased, while its substance is rendered proportionally thinner, the resistance is not so considerable.

When such an exostosis depends upon a particular constitutional cause, and, especially upon one of a venereal nature, it must be attacked by remedies suited to this affection. But, when the disease resists internal remedies, and its magnitude is likely to produce an aggravation of the case, a portion of the bone may be removed with a trephine, or a cutting instrument. Such operations, however, require a great deal of delicacy and prudence.

Mr. B. Bell, vol. 4, describes a kind of exostosis of the upper jaw, very different from what we have mentioned, since instead of its being distinguishable from other diseases of the antrum by the greater firmness of the tumour, the substance of the bone gradually acquires such suppleness and elasticity, that it yields to the pressure of the fingers, and immediately resumes its former plumpness, when the pressure is discontinued. If the bone be cut, it is found to be as soft as cartilage, and, in an advanced stage of the disease, its consistence is almost gelatinous. The swelling increases gradually, and extends equally over the whole cheek, without becoming prominent at any particular point, or only so in the latter periods of the malady, when the soft parts inflame and become affected. The complaint is described as totally incurable. Cutting and trephining the tumour, as recommended in other cases of exostosis, only aggravate the patient's unhappy condition.

Mr. Abernethy has related an account of a very singular disease of the antrum. The patient, who was 34 years of age when the account was written, perceived, when about ten years old, a small tumour on his left cheek, which gradually attained the size of a walnut, and then remained, for some time, stationary. About a year afterwards, the tumour having again enlarged, a caustic was applied to the integuments, so as to expose the bone. The actual cautery was next applied, and an opening thus made into the antrum. After the exfoliation, the antrum became filled with a fungus, which rose out upon the cheek, and could not be restrained by any applications. Part of the fungus also made its way into the mouth, through the socket of the second tricuspid tooth, the other teeth remaining natural. The disease continued in this state nine years, occasionally bleeding in an alarming way. When the patient was in his 20th year, the whole fungus sloughed away during a fever, and never returned. After this the sides of the aperture in the bone began to grow outwards, forming an exostosis, which has grown to a great magnitude. A small exostosis took place in the mouth, but became no larger than a horse bean. The exostosis of the maxillary bone was of an irregular figure, and projected from the whole circumference of the aperture a great way directly forward. Mr. Abernethy compared its appearance, when he was writing, with that of a large tea-cup fastened upon the face, the bottom of which may be supposed to communicate with the antrum. The diameter of the cup, formed by the circular edge of the bone, was three inches and a half; the depth two inches and seven-eighths. The general height of the sides of the exostosis, from the basis of the face was two inches; its walls were not thick, and terminated in a thin circular edge. The integuments, as they approached this edge, became thinner, and they extended over the edge into the cavity. The exostosis now reaches to the nose in front, and to the masseter muscle behind; above it includes the very ridge of the orbit, and below it grows from the edge of the alveolary process. A line that would have separated the diseased from the sound bone, would have included the orbit and nose, and indeed, one half of the face. Mr. Abernethy saw no means of affording the man relief. (*Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol. 2.*)

In a case of fungus, which had distended the antrum, hindered the tears from passing down into the nose, raised the lower part of the orbit, caused a protrusion of the eye, made two of the grinding teeth fall out, and occasioned a carious opening in the front of the antrum, through which opening a piece of the fungus projected, Desault operated as follows: the cheek was first detached from the os maxillare, by dividing the internal membrane of the mouth, at the place where it is reflected over this bone. Thus, the outer surface of the bone was denuded of all the soft parts. A sharp, perforating instrument was applied to the middle of this surface, and an opening made more forward than the one already existing. The plate of bone, situated between the two apertures, was removed with a little falciform knife, which, being directed from behind forward, made the division without difficulty. The opening, thus obtained, being insufficient, Desault endeavoured to enlarge it below, by sacrificing the alveolary process. This he endeavoured to accomplish with the same instrument, but, finding the resistance too great, he had recourse to a gouge and mallet. A considerable piece of the alveolary arch was thus detached, without any previous extraction of the corresponding teeth, three of which were removed by the same stroke. In this manner an opening was procured in the external and inferior part of the antrum, large enough to admit a walnut. Through this aperture a considerable part of the tumour was cut away with a knife, curved sideways, and fixed in its handle. A most profuse hemorrhage took place; but, Desault, unalarmed, held a compress in the antrum for a short time; this being removed, the actual cautery was applied repeatedly to the rest of the fungus. The cavity was dressed with lint, dipped in powdered colophony.

On the eighteenth day the swelling was evidently diminished, the eye less prominent, and the epiphora less visible. But, at this period, a portion of fungus made its appearance again. This was almost entirely destroyed by applying the actual cautery twice. It appeared again, however, on the 25th day, and required a third and last recourse to the cautery. From this time the progress of the cure went on rapidly. Instead of fungous excrescences, healthy granulations were now formed in the bottom of the sinus. The parietes of the antrum, gradually approaching each other, the large opening made in the operation was obliterated, and reduced to a small aperture, hardly large enough to admit a probe. Even this little opening was closed in the fourth month, at which time no vestiges of the disease remained, except the loss of teeth, and a very obvious depression just where they were situated.

In all fungous diseases of the antrum, making a free exposure of them is an essential part of the treatment: if you neglect this method, how can you inform yourself of the size, form, and extent, of the tumour? How could you remove the whole of the fungus, through a small opening, which would only allow you to see a very little portion of the excrescence? How could you be certain that the disease were extirpated, to its very root? Even when the antrum is freely opened, this circumstance can only be learnt with difficulty; and how could it be ascertained, when only a point of the cavity is opened? A portion, left behind, very soon gives origin to a fresh fungus, the progress of which is more rapid, and the character more fatal, in consequence of being irritated by the surgical measures adopted. (*Œuvres Chirurgicales de Desault par Bichat, Tom. 2.*)

I imagine that English surgeons, unaccustomed to use the actual cautery, will peruse with a degree of aversion, this means so commonly employed in France by Desault, and other celebrated surgeons. Nor can I expect that they will altogether approve the use of the mallet and gouge, for making a free opening into the antrum. Perhaps, it might be better to trephine this cavity with a small instrument for the purpose, and then cut the fungus away. After removing as much of it as possible in this manner, some instrument of suitable shape might be used to scrape the part, where the tumour has its root. However, if there be any case in which potent and violent measures, like those of Desault, are allowable, it is the one, of which we have just been treating. Inveterate diseases demand powerful means, and tampering with them is generally more hurtful than useful.

There is an interesting case of a fungus in the maxillary sinus, related in the first volume of the Parisian Chirurgical Journal. It was at last cured by opening the antrum, applying the cautery, and tying the portion of the tumour, which had made its way into the nose. In the second volume of the same work, is an excellent case, exhibiting the dreadful ravages, which the disease may produce when left to itself.

### INSECTS IN THE ANTRUM.

It is said, that insects in this cavity may sometimes make it necessary to open the part. This case, however, must be exceedingly rare, and even what we find in authors (*Pallas de insectis viventibus intra viventia*), appears so little authentic, that we should hardly have thought it necessary to make mention of the circumstance, if there were not, in a modern work (*Med. Comm. Vol.* 1.) a fact which appears entitled to attention. Mr. Heysham, a medical practitioner at Carlisle, relates, that a strong woman, aged sixty, in the habit of taking a great deal of snuff, was subject, for several years, to acute pains in the antrum, extending over one side of the head. These pains never entirely ceased, but were more severe in winter than summer, and were always subject to frequent periodical exacerbations. The patient had taken several anodyne medicines, and others, without benefit, and had twice undergone a course of mercury, by which her complaints had been increased. All her teeth on the affected side had been drawn. At length it was determined to open the antrum with a large trocar, though there were no symptoms of an abscess, nor of any other disease in this cavity. For four days no benefit resulted from this operation. During this space, bark injections, and the elixir of aloes, were introduced into the sinus. On the fifth day a dead insect was extracted, by means of a pair of forceps, from the mouth of the cavity. It was more than an inch long, and thicker than a common quill. The patient now experienced relief for several hours: but, the pains afterwards recurred with as much severity as before; oil was next injected into the antrum, and two other insects, similar to the former, were extracted. No others appeared, and the wound closed. The pains were not completely removed, but they were considerably diminished for several months, at the end of which time they became worse than ever, particularly affecting the situation of the frontal sinus.

M. Bordenave has published, in the twelfth and thirteenth volumes of the Mem. de l'Acad. de Chir. Edit. 12mo. two excellent papers on the diseases of the antrum. In the thirteenth volume, he relates the history of a case, in which several small whitish worms, together with a piece of fetid fungus, were discharged from the antrum, after an opening had been made on account of an abscess of the antrum, attended with caries. (*P.* 381.) But, in this instance, the worms had probably been generated after the opening had been made in the cavity; for, when they made their appearance, the opening had existed nine months.—(See on this subject *Precis d'Observations sur les Maladies du Sinus Maxillaire par M. Bordenave, in Mem. de l'Acad. Royale de Chirurgie, Tom.* 12, *Edit. in* 12*mo. Also Suite d'Observations on the same Subject, by M. Bordenave, Tom.* 13, *of the said Work. L'Encyclopédie Méthodique, Partie Chirurgicale, art. Antre Maxillaire. Remarques et Observations sur les Maladies du Sinus Maxillaire, in Œuvres Chirurgicales de Desault par Bichat, Tom.* 2, *p.* 156. *Desault's Parisian Chirurgical Journal, Vol.* 1 *and* 2. *Medical Communications, Vol.* 1. *Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol.* 2. *Natural History of the Human Teeth, by John Hunter, p.* 174, 175, *Edit.* 3. *Gooch's Chirurgical Works, Vol.* 2, *p.* 61, *and Vol.* 3, *p.* 161, *Edit.* 1792. *Callisen's Systema Chirurgiæ Hodiernæ, T.* 1, *p.* 346, *&c.*

**ANUS.** The lower termination of the great intestine, named the rectum, is so called, and its office is to form an outlet for the feces.

The anus is furnished with muscles, which are peculiar to it, viz. the sphincter, which keeps it habitually closed, and the *levatores ani*, which serve to draw it up into its natural situation, after the expulsion of the feces. It is also surrounded, as well as the whole of the neighbouring intestine, with muscular fibres, and a very loose sort of cellular substance.

The anus is subject to various diseases, in which the aid of surgery is requisite: of these we shall next treat.

### IMPERFORATE ANUS.

This complaint is sometimes met with, though not very often. As it is of the utmost consequence that the mal-formation should not remain long unknown, one of the earliest duties of an accoucheur, after delivery, should be the examination of all the natural outlets of new-born infants.

Such an inspection sometimes evinces, that the place in which the extremity of the rectum, or the anus, ought to be, is entirely, or partly, shut up by a membrane, or fleshy adhesion. In other instances, no vestige of the intestine can be found, as the skin retains its natural colour over the whole space, between the parts of generation and the os coccygis, without being more elevated in one place than another. In these cases the intestine sometimes terminates in one or two culs-de-sac, about an inch upward from the ordinary situation of the anus. Sometimes it does not descend lower than the upper part of the sacrum; sometimes it opens into the bladder, or vagina.

When a surgeon is consulted, he must not lose much time in deliberation; for, if a speedy opening be not made for the feces, the infant will certainly very soon perish, with symptoms similar to those of a strangulated hernia. After ascertaining the complaint, which is an easy matter, he should endeavour to learn, whether the anus is merely shut by a membrane, or fleshy adhesion: or whether the anus is altogether wanting, in consequence of the lower portion of the cavity of the gut being obliterated, or the rectum not extending sufficiently far down.

When a membrane, or production of the skin closes the opening of the rectum, the part producing the obstruction, is somewhat different in colour from the neighbouring integuments. It is usually of a purple or livid hue, in consequence of the accumulation of the meconium on its inner surface. The meconium, propelled downward by the viscera above, forms a small, roundish prominence, which yields like dough to the pressure of the fingers; but, immediately projects again, when the pressure is removed. When a fleshy adhesion closes the intestine, the circumstance is obvious to the eye, if the part protrude, which is generally the case. The finger feels greater hardness and resistance, than when there is a mere membrane, and the livid colour of the meconium cannot be seen through the obstructing substance.

These last signs alone are enough to convince the surgeon of the necessity of the operation; but, they do not clearly shew, whether the intestine descends, as far as it ought, in order to form a proper kind of anus. Complete information on this point can only be acquired, after the membrane, or adhesion, has been divided; or else after the child's death, when the operation has proved ineffectual. Though there be no mark to denote, where the anus ought to be situated, and no degree of prominence, yielding, like soft dough, to the pressure of the fingers, and rising again, when such pressure is removed; yet, it may happen, especially on our being consulted immediately after the child is born, that, notwithstanding the absence of such symptoms, denoting the presence of the meconium, and the natural extent of the intestine, as far as where the anus ought to be, the gut may exist, and have a cavity, as far as the membrane, or adhesion, closing it.

When the anus is simply covered with skin, and its place pointed out by a prominence, arising from the contents of the rectum, we have only to make an opening with a knife, sufficient to let out the meconium. Levret recommends making a circular incision in the membrane; but, a transverse cut is sufficient. A small tent of lint is afterwards to be introduced, in order to keep the opening from closing. If the anus should only be partly closed by a membrane, the opening may be dilated with a tent; but, if the aperture should be very small, it is preferable to use the bistoury for its enlargement.

When no external appearance denotes where the situation of the anus ought to be, the case is much more serious and embarrassing; and this, whether the intestine is stopped up by a fleshy adhesion, or the coalescence of its sides, or whether a part of the gut is wanting.

However, it is the surgeon's duty to do every thing in his power to afford relief. For this purpose, an incision, an inch long, is to be made in the situation where the anus ought to be, and the wound is to be carried more and more deeply in the natural direction of the rectum. The cuts are not to be made directly upwards, nor in the axis of the pelvis, for the vagina, or bladder, might thus be wounded. On the contrary, the operator should cut backward, along the concavity of the os coccygis, where there is no danger of wounding any part of importance. In all cases of this kind, the surgeon's finger is the best director. The operator, guided by the index finger of his left hand, introduced within the os coccygis, is to dissect in the direction above recommended, until he reaches the feces, or has cut as far as he can reach with his finger. If he should fail in finding the meconium, as death must unavoidably follow, one more attempt ought to be made, by introducing, upon the finger, a long trocar, in such a direction as seems best calculated for finding the rectum.

By the prudent adoption of such proceedings, many infants have been preserved, which otherwise would have been devoted to certain death. Hildanus, La Motte, Roonhuysen, and several others, have successfully adopted the above practice. Mr. B. Bell informs us, he has seen two of these cases, in which the intestine was very distant from the integuments, and in which he was so successful, as to form an anus, which fulfilled its office tolerably well for several years; but, he found it exceeding difficult to keep the passage sufficiently large and pervious. As soon as he removed the dossils of lint, and other kinds of tents, used for maintaining the necessary dilatation, such a degree of contraction speedily followed, that the evacuation of the intestinal matter became very difficult, for a long while afterwards. He employed, at different times, tents made of sponge, gentian root, and other substances, which swell on being moistened. But these always produced so much pain and irritation, that it was impossible to persevere in their use. After remarking such inconveniences, he condemns the use of tents. He is of opinion, that whoever makes trial of them upon parts, as sensible as the rectum, will soon find, that the advice to use them is wrong.

Tents, made of very soft lint, dipped in oil, or rolls of bougie plaster, cause less irritation, than those composed of any other materials.

Though keeping the opening dilated may seem simple and easy, to such men as have had no opportunities of seeing cases of this description, it is far otherwise in practice. Mr. Bell assures us, that he never met with any disease, which gave him so much trouble and embarrassment, as he experienced in the two cases of this sort, which occurred in his practice. Although in both instances, he at first made the openings sufficiently large, it was only by very assiduous attention, for eight or ten months, that the necessity for another operation, and even repeated operations, was prevented. When only the skin has been divided, the rest of the treatment is doubtless more simple; for, then, nothing more is requisite, than keeping a piece of lint, for a few days, in the opening made with the knife. But, when the extremity of the rectum is at a certain distance, though we may generally hope to effect a cure, after having succeeded in giving vent to the intestinal matter; yet, the treatment, after the operation, will always demand a great deal of attention and care on the part of the surgeon, for a long while. The difficulty of success may be considered as, in some measure, proportioned to the depth of the necessary incision.

Sometimes, while the anus appears pervious and well-formed, infants suffer the same symptoms, as if there were no anus at all. The reason of this depends upon the intestine being occasionally closed by a membranous partition, situated more or less upward, above the aperture of the anus, and, sometimes the symptoms are owing to the termination of the gut in a cul-de-sac. This erroneous formation may always be suspected, whenever an infant, whose anus is externally open, does not void any excrement, for two or three days after its birth, and, especially, when urgent symptoms arise, such as swelling of the belly, vomiting, &c. We are now to endeavour to ascertain, whether the rectum is impervious above the anus, by attempting to inject glysters, or to introduce a probe. If the gut be shut up, there is nothing to be done, but having recourse to the method described above, and forming a communication by means of a bistoury guided on the finger, or else with a pharyngotomus. If the obstacle should only consist of a transverse membrane, the operation will be easy, and its success almost certain. But, if there should be a strangulation, or obstruction of the intestine, the case is infinitely more serious. However, as the operation is the only resource for saving the child's life, we ought not to hesitate about performing it.

When the anus is imperforate, the intestine sometimes opens into the vagina, or bladder. The first of these cases is the least dangerous of all the malformations of this sort. The intestine may also open, and terminate at two places, at the same time, viz. at the usual place, so as to form a proper anus, more or less perfect; and also in the vagina.

If these two openings should be ample enough for the easy evacuation of the excrement, nothing can be done at so tender an age; for, though voiding the feces through the vagina, is a most unpleasant inconvenience, yet, there is no effectual means of closing the opening of the intestine in this situation, nor could one be devised, which would not seriously incommode the infant.

But, when the two openings are exceedingly small, and the alvine evacuations cannot readily pass out, even with the aid of glysters, the opening of the anus ought to be dilated by cannulæ of different sizes. If this method should not avail, the knife must be employed, and the wound dressed, as already explained.

For the most part, the intestine has only one opening in the vagina. In this circumstance, as in the instance in which the feces have no vent at all, we must make an incision in that place, which the anus ought to occupy. The natural course of the feces being opened by this operation, which in such a case is not at all perilous, much less excrement will pass out of the vagina, and, of course, the infirmity will be diminished. By the introduction of a tube into the new anus, the communication between the rectum and vagina, might possibly be obliterated, and a perfect cure accomplished. The opening between the intestine and vagina, may, also, be too small for the easy evacuation of the feces, and this might even expose the infant to the same sort of dangerous symptoms, as it would be subject to, if the rectum had positively no opening at all.

In male infants, the rectum sometimes opens into the bladder, and, in this circumstance, there is generally no anus. The case is easily known by the meconium being blended with the urine, which acquires a thick greenish appearance, and is voided almost continually, though in small quantities. Only the most fluid part of the meconium, is thus discharged. The thicker part not getting from the rectum into the bladder, nor from the bladder into the urethra, greatly distends the intestines and bladder, and produces the same symptoms, as take place, in cases of total imperforation. Hence, without the speedy interference of art to form an anus, capable of giving vent to the feces, with which the urinary organs cannot remain obstructed, the infant will inevitably die. This case must, therefore, be treated like the foregoing ones. Though we can hardly hope to prevent altogether the inconveniences, resulting from the rectum opening into the bladder, since even a new passage will not completely hinder the feces from following the other course; yet, we shall thus afford the child a very good chance of preservation, and the only one which its situation will allow.

In cases, in which we cannot procure an outlet for the feces, by any of the methods pointed out above, it has been proposed by M. Littre, to make an opening above one of the groins, find out a portion of intestine, open it, fix it in this situation with a few stitches, and thus form an artificial anus. M. Sabatier was only acquainted with one case, in which this proceeding had been actually done, viz. the example, where M. Duret, a French naval surgeon, operated. This gentleman cut into the abdomen at the lower part of the left iliac region, and, having opened the sigmoid flexure of the colon, he fixed it near the wound. The child was saved by the formation of an artificial anus; but, at the age of twenty-five months, it continued to be troubled with a sort of prolapsus of the lining of the bowel. (*Méd. Opératoire, T.* 3, *p.* 336, *Edit.* 2.)

Callisen conceives, that the descending colon may be most conveniently got at by making an incision in the left lumbar region, along the edge of the quadratus lumborum muscle, and he prefers this mode of operating, to that of making the incision above the groin. (*Syst. Chir. Hodiernæ, T.* 2, *p.* 688, 689.) Its advantages, however, are not obvious, and certainly it is on some accounts objectionable. (See *Médecine Opératoire par Sabatier, Tom.* 3, *p.* 330. *Also Remarques sur Différens Vices de Conformation, que les Enfans apportent en naissant, par M. Petit, in Mem. de l'Acad. Royale de Chirurgie, Tom.* 2, *p.* 236, *Edit. in* 12*mo. Richerand's Nosographie Chirurgicale, Tom.* 3, *p.* 437, *&c. Edit.* 4. *Callisen's Systema Chirurgiæ Hodiernæ, T.* 2, *p.* 686, *Edit.* 1800.

### ABSCESSES OF THE ANUS.—FISTULA IN ANO.

The custom of giving the appellation of *fistula* to every collection of matter formed near to the anus, has, by conveying a false notion of them, been productive of such methods of treating them, as are diametrically opposite to those which ought to be pursued.

A small orifice or outlet from a large or deep cavity, discharging a thin gleet, or sanies, made a considerable part of the idea, which our ancestors had of a fistulous sore, wherever seated. With the term fistulous, they always connected a notion of callosity: and, therefore, whenever they found such a kind of opening yielding such sort of discharge, and attended with any degree of induration, they called the complaint a *fistula*. Imagining this callosity to be a diseased alteration made in the very structure of the parts, they had no conception that it could be cured by any means, but by removal with a cutting instrument, or by destruction with escharotics: and, therefore, they immediately attacked it with knife or caustic, in order to accomplish one of these ends: and very terrible work they often made.

That abscesses, formed near the fundament, do sometimes, from bad habits, from extreme neglect, or from gross mistreatment, become fistulous, is certain; but the majority of them have not, at first, any one character or mark of a true fistula; nor can, without the most supine neglect on the side of the patient, or the most ignorant mismanagement on the part of the surgeon, degenerate, or be converted into one.

Collections of matter from inflammation (wherever formed) if they be not opened in time, and in a proper manner, do often burst. The hole, through which the matter finds vent, is generally small, and not often situated in the most convenient, or most dependent part of the tumour: it therefore is unfit for the discharge of all the contents of the abscess; and, instead of closing, contracts itself to a smaller size, and becoming hard at its edges, continues to drain off what is furnished by the undigested sides of the cavity.

When an abscess about the anus bursts, the smallness of the accidental orifice; the hardness of its edges; its being found to be the outlet from a deep cavity; the daily discharge of a thin, gleety, discoloured kind of matter; and the induration of the parts round about, have all contributed to raise, and confirm the idea of a true fistula.

Upon this idea was built the old pernicious doctrine of free excision, or as free destruction.

Abscesses about the anus present themselves, in different forms.

Sometimes the attack is made with symptoms of high inflammation; with pain, fever, rigor, &c. and the fever ends as soon as the abscess is formed.

In this case, a part of the buttock near to the anus is considerably swollen, and has a large circumscribed hardness. In a short time, the middle of this hardness becomes red, and inflamed; and in the centre of it matter is formed.

This (in the language of our ancestors) is called in general a *phlegmon;* but when it appears in this particular part, a *phyma.*

The pain is sometimes great, the fever high, the tumour large, and exquisitely tender; but however disagreeable the appearances may have been, or however high the symptoms may have risen, before suppuration, yet, when that end is fairly and fully accomplished, the patient generally becomes easy and cool; and the matter formed under such circumstances, though it may be plentiful, yet is good.

On the other hand, the external parts, after much pain, attended with fever, sickness, &c. are sometimes attacked with considerable inflammation, but without any of that circumscribed hardness, which characterised the preceding tumour; instead of which, the inflammation is extended largely, and the skin wears an erysipelatous kind of an appearance. In this, the disease is more superficial; the quantity of matter small, and the cellular membrane sloughy to a considerable extent.

Sometimes, instead of either of the preceding appearances, there is formed in this part, what the French call *une suppuration gangreneuse;* in which the cellular and adipose membrane is affected in the same manner, as it is in the disease called a carbuncle.

In this case the skin is of a dusky red or purple kind of colour; and although harder than when in a natural state, yet it has, by no means, that degree of tension or resistance, which it has either in the phlegmon, or in the erysipelas.

The patient has generally, at first, a hard, full, jarring pulse, with great thirst, and very fatiguing restlessness. If the progress of the disease be not stopped, or the patient relieved by medicine, the pulse soon changes into an unequal, low, faltering one; and the strength and the spirits sink in such manner, as to imply great and immediately impending mischief. The matter formed under the skin, so altered, is small in quantity, and bad in quality; and the adipose membrane is gangrenous and sloughy throughout the extent of the discoloration. This generally happens to persons, whose habit is either naturally bad, or rendered so by intemperance.

In each of these different affections, the whole malady is often confined to the skin and cellular membrane underneath it; and no other symptoms attend, than the usual general ones, or such as arise from the formation of matter or sloughs in the part immediately affected. But it also often happens, that, added to these, the patient is made unhappy by complaints arising from an influence, which such mischief has on parts in the neighbourhood of the disease; such as the urinary bladder, the vagina, the urethra, the hæmorrhoidal vessels, and the rectum; producing retention of urine, strangury, dysury, bearing down, tenesmus, piles, diarrhœa, or obstinate costiveness: which complaints are sometimes so pressing, as to claim all our attention. On the other hand, large quantities of matter, and deep sloughs are sometimes formed, and great devastation committed on the parts about the rectum, with little or no previous pain, tumour, or inflammation.

Sometimes the disease makes its first appearance in an induration of the skin, near to the verge of the anus, but without pain or alteration of colour; which hardness gradually softens and suppurates. The matter, when let out, in this case, is small in quantity, good in quality; and the sore is superficial, clean, and well-conditioned. On the contrary, it now and then happens, that although the pain is but little, and the inflammation apparently slight, yet the matter is large in quantity, bad in quality, extremely offensive, and proceeds from a deep crude hollow, which bears an ill-natured aspect.

The place also where the abscess points, and where the matter, if let alone, would burst its way out, is various and uncertain. Sometimes it is in the buttock, at a distance from the anus; at other times near its verge, or in the perineum, and this discharge is made sometimes from one orifice only, sometimes from several. In some cases, there is not only an opening through the skin, externally, but another through the intestine into its cavity: in others, there is only one orifice, and that either external, or internal.

Sometimes the matter is formed at a

considerable distance from the rectum, which is not even laid bare by it; at others, it is laid bare also, and not perforated: it is also sometimes not only denuded, but pierced; and that in more places than one.

All consideration of preventing suppuration, is generally out of the question: and our business, if called at the beginning, must be to moderate the symptoms; to forward the suppuration; when the matter is formed, to let it out; and to treat the sore in such manner, as shall be most likely to produce a speedy and lasting cure.

When there are no symptoms which require particular attention, and all that we have to do is to assist the maturation of the tumour, a soft poultice is the best application. When the disease is fairly of the phlegmonoid kind, the thinner the skin is suffered to become, before the abscess be opened, the better: as the induration of the parts about will thereby be the more dissolved, and, consequently, there will be the less to do after such opening has been made. This kind of tumour is generally found in people of full, sanguine habits; and who, therefore, if the pain be great, and the fever high, will bear evacuation, both by phlebotomy, and gentle cathartics: which is not often the case of those, who are said to be of bilious constitutions; in whom the inflammation is of a larger extent, and in whom the skin wears the yellowish tint of the erysipelas; persons of such kind of habit, and in such circumstances, being in general seldom capable of bearing large evacuation.

When the inflammation is erysipelatous the quantity of matter formed is small, compared with the size and extent of the tumour; the disease is rather a sloughy, putrid state of the cellular membrane, than an imposthumation; and therefore, the sooner it is opened, the better: if we wait for the matter to make a point, we shall wait for what will not happen; at least, not till after a considerable length of time: during which, the disease in the membrane will extend itself, and, consequently, the cavity of the sinus, or abscess, be thereby greatly increased.

When, instead of either of the preceding appearances, the skin wears a dusky, purplish-red colour; has a doughy, unresisting kind of feel, and is very little sensible: when these circumstances are joined with an unequal, faltering kind of pulse, irregular shiverings, a great failure of strength and spirits, and inclination to doze, the case is formidable, and the event generally fatal.

The habit, in these circumstances, is always bad; sometimes from nature, but much more frequently from gluttony and intemperance. What assistance art can lend, must be administered speedily; every minute is of consequence; and if the disease be not stopped, the patient will sink. Here is no need for evacuation of any kind: recourse must be immediately had to medical assistance; the part affected should be frequently fomented with hot spirituous fomentations; a large and deep incision should be made into the diseased parts, and the application made to it should be of the warmest, most antiseptic kind.

This also is a general kind of observation, and equally applicable to the same sort of disease in any part of the body. Our ancestors have thought fit to call it in some a carbuncle, and in others, by other names; but it is (wherever seated) really and truly, a gangrene of the cellular and adipose membrane; it always implies great degeneracy of habit, and, most commonly, ends ill.

Strangury, dysury, and even total retention of urine, are no very uncommon attendants upon abscesses forming in the neighbourhood of the rectum and bladder; more especially, if the seat of them be near the neck of the latter.

They sometimes continue from the first attack of the inflammation, until the matter is formed, and has made its way outward; and sometimes last a few hours only.

The two former most commonly are easily relieved by the loss of blood, and the use of gum arabic, with nitre, &c. But in the last (the total retention), they who have not often seen this case, generally have immediate recourse to the catheter; but the practice is essentiallly wrong.

The neck of the bladder does certainly participate, in some degree, in the said inflammation. But, the principal part of the complaint arises from irritation, and the disease is, strictly speaking, spasmodic. The manner in which an attack of this kind is generally made; the very little distention which the bladder often suffers; the small quantity of urine sometimes contained in it, even when the symptoms are most pressing; and the most certain, as well as safe, method of relieving it; all tend to strengthen such opinion.

But whether we attribute the evil to inflammation, or to spasmodic irritation, whatever can, in any degree, contribute to the exasperation of either, must be manifestly wrong. The violent passage of the catheter through the neck of the bladder (for violent in such circumstances it must be) can never be right.

If the instrument be successfully introduced, it must either be withdrawn as soon as the bladder is emptied, or it must be left in it: if the former be done, the same cause of retention remaining, the same effect returns; the same pain and violence must again be submitted to, under (most likely) increased difficulties. On the other hand, if the catheter be left in the bladder, it will often, while its neck is in this state, occasion such disturbance, that the remedy (as it is called) will prove an exasperation of the disease, and add to the evil it is designed to alleviate; nor is this all; for the resistance which the parts, while in this state, make, is sometimes so great, that if any violence be used, the instrument will make for itself a new route in the neighbouring parts, and lay the foundation of such mischief as frequently baffles all our art.

The true, safe, and rational method of relieving this complaint is by evacuation and anodyne relaxation: this not only procures immediate ease, but does, at the same time, serve another very material purpose; which is that of maturating the abscess. Loss of blood is necessary; the quantity to be determined by the strength and state of the patient: the intestines should also be emptied, if there be time for so doing, by a gentle cathartic; but the most effectual relief will be from the warm bath, or semicupium, the application of bladders with hot water to the pubes and perineum, and, above all other remedies, the injection of glysters, consisting of warm water, oil, and opium. There may have been cases which have resisted and baffled this method of treatment; but Pott has never met with them.

A painful tenesmus is no uncommon attendant upon an inflammation of the parts about the rectum.

If a dose of rhubarb, joined with a warm anodyne, such as the conf. mithrid. or suchlike, does not remove it, the injection of thin starch and opium, or tinct. thebaic. is almost infallible.

The bearing down, in females, as it proceeds in this case, from the same kind of cause (viz. irritation) admits of relief from the same means as the tenesmus.

In some habits an obstinate costiveness attends this kind of inflammation, accompanied, not unfrequently, with a painful distention and enlargement of the hæmorrhoidal vessels, both internally and externally. While a quantity of hard feces are detained within the large intestines, the whole habit must be disordered; and the symptomatic fever, which necessarily accompanies the formation of matter, must be considerably heightened. And while the vessels surrounding the rectum (which are large and numerous) are distended, all the ills proceeding from pressure, inflammation, and irritation, must be increased. Phlebotomy, laxative glysters, and a low, cool regimen, must be the remedies; while a soft cataplasm applied externally serves to relax and mollify the swollen, indurated piles, at the same time that it hastens the suppuration.

When the abscesses have formed, and are fit to be opened, or when they have already burst, they may be reduced to two general heads, viz.

1. Those, in which the intestine is not at all interested; and,

2. Those, in which it is either laid bare, or perforated.

In making the opening, the knife or lancet should be passed in deep enough to reach the fluid; and, when it is in, the incision should be continued upward and downward, in such manner as to divide all the skin covering the matter. By these means, the contents of the abscess will be discharged at once; future lodgment of matter will be prevented; convenient room will be made for the application of proper dressings; and there will be no necessity for making the incision in different directions, or for removing any part of the skin composing the verge of the anus.

Notwithstanding all these collections of matter are generally called *fistulæ*, and are all supposed to affect the intestinum rectum, yet it is very certain that the seat of the abscess, is sometimes at such distance from the gut, that it is not at all interested by it; and that none of these cases either are, or can be originally *fistulæ*.

In this state of the disease, we have no more necessarily to do with the intestine, than if it was not there; the case is to be considered merely as an abscess in the cellular membrane.

Suppose a large and convenient opening to have been made by a simple incision; the contents of the abscess to have been thereby discharged; and a sore or cavity produced, which is to be filled up.

The term *filling up*, and the former opinion, that the induration of the parts about is a diseased callosity, have been the two principal sources of misconduct in these cases.

The old opinion, with regard to hollow and hardness, was that the former is caused entirely by loss of substance: and the latter, by diseased alteration in the structure of the parts.

The consequence of which opinion was, that as soon as the matter was discharged, the cavity was filled and distended, in order to procure a gradual regeneration of flesh, and the dressings, with which it was so filled, were most commonly of the escharotic kind, intended for the dissolution of hardness.

The practice is a necessary consequence of the theory. Whoever supposes diseased callosity, and great loss of substance, will necessarily think himself obliged to do stroy the former, and to prevent the cavity, formed by the latter, from filling up too hastily. On the other hand, he who regards the cavity of the abscess as being principally the effect of the gradual distraction and separation of its sides, with very little loss of substance, compared with the size of the said cavity; and who looks upon the induration round about, as nothing more than a circumstance which necessarily accompanies every inflammation in membranous parts, more especially in those which tend to suppuration; will, upon the smallest reflection, perceive, that the dressings applied to such cavity ought to be so small in quantity, as to permit nature to bring the sides of the cavity toward each other, and that such small quantity of dressings ought to consist of materials proper only to encourage easy and gradual suppuration.

Suppuration is to be produced and maintained, not by thrusting in such applications, as by their quantity distend, and by their quality irritate and destroy; but by dressing lightly and easily with such as appease, relax and soften.

If the hollow, immediately it is opened, be filled with dressings (of any kind), the sides of it will be kept from approaching each other, or may even be farther separated. But if this cavity be not filled, or have little or no dressings of any kind introduced into it, the sides immediately collapse; and, coming nearer and nearer, do, in a very short space of time, convert a large hollow into a small sinus. And this is also constantly the case, when the matter, instead of being let out by an artificial opening, escapes through one made by the bursting of the containing parts.

True, this sinus will not always become perfectly closed; but the aim of nature is not, therefore, the less evident; nor the hint, which art ought to borrow from her, the less palpable.

In this, as in most other cases, where there are large sores, or considerable cavities, a great deal will depend on the patient's habit, and the care that is taken of it: if that be good, or if it be properly corrected, the surgeon will have very little trouble in his choice of dressings; only to take care that they do not offend either in quantity or quality: but if the habit be bad, or injudiciously treated, he may use the whole farrago of externals, and only waste his own and his patient's time.

By light, easy treatment, large abscesses formed in the neighbourhood of the rectum will sometimes be cured, without any necessity occurring of meddling with the said gut. But it much more frequently happens, that the intestine, although it may not have been pierced or eroded by the matter, has yet been so stripped or denuded, that no consolidation of the sinus can be obtained, but by a division; that is, by laying the two cavities, viz. that of the abscess, and that of the intestine, into one.

When the intestine is found to be separated from the surrounding parts by the matter, the operation of dividing it had better (on many accounts) be performed at the time the abscess is first opened, than be deferred to a future one. For, if it be done properly, it will add so little to the pain, which the patient must feel by opening the abscess, that he will seldom be able to distinguish the one from the other, either with regard to time or sensation; whereas, if it be deferred, he must either be in continual expectation of a second cutting, or feel one at a time when he does not expect it.

The intention in this operation is to divide the intestine rectum from the verge of the anus up as high as the top of the hollow in which the matter was formed; thereby to lay the two cavities of the gut and abscess into one; and by means of an open, instead of a hollow or sinuous sore, to obtain a firm and lasting cure.

For this purpose, the curved, probe-pointed knife, with a narrow blade, is the most useful and handy instrument of any. This, introduced into the sinus, while the surgeon's fore-finger is in the intestine, will enable him to divide all that can ever require division; and that with less pain to the patient, with more facility to the operator, as well as with more certainty and expedition than any other instrument whatever. If there be no opening in the intestine, the smallest degree of force will thrust the point of the knife through, and thereby make one: if there be one already, the same point will find and pass through it. In either case, it will be received by the finger in ano; will thereby be prevented from deviating, and being brought out by the same finger, must necessarily divide all that is between the edge of the knife, and the verge of the anus: that is, must by one simple incision (which is made in the smallest space of time imaginable) lay the two cavities of the sinus and of the intestine into one.

Authors make a very formal distinction between those cases in which the intestine is pierced by the matter, and those in which it is not; but although this distinction may be useful when the different states of the disease are to be described, yet in practice, when the operation of dividing the gut becomes necessary, such distinction is of no consequence at all; it makes no alteration in the degree, kind, or quantity of pain which the patient is to feel; the force required to push the knife through the tender gut is next to none, and when its point is in the cavity, the cases are exactly similar.

Immediately after the operation, a soft dossil of fine lint should be introduced (from the rectum) between the divided lips of the incision; as well to repress any slight hæmorrhage, as to prevent the immediate reunion of the said lips; and the rest of the sore should be lightly dressed with the same. This first dressing should be permitted to continue, until a beginning suppuration renders it loose enough to come away easily; and all the future ones should be as light, soft, and easy as possible; consisting only of such materials as are likely to promote kindly and gradual suppuration. The sides of the abscess are large; the incision must necessarily, for a few days, be inflamed; and the discharge will, for some time, be discoloured and gleety: this induration, and this sort of discharge, are often mistaken for signs of diseased callosity, and undiscovered sinuses; upon which presumptions, escharotics are freely applied, and diligent search is made for new hollows: the former of these most commonly increase both the hardness and the gleet; and by the latter new sinuses are sometimes really produced. These occasion a repetition of escharotics, and, perhaps, of incisions; by which means, cases which at first, and in their own nature were simple and easy of cure, are rendered complex and tedious.

To quit reasoning, and speak to fact only: In the great number of these cases, which must have been in St. Bartholomew's Hospital, within these ten or twelve years, *I do aver*, (says Pott) *that I have not met with one, in the circumstances before described, that has not been cured by mere simple division, together with light, easy dressings: and that I have not, in all that time, used for this purpose, a single grain of præcipitate, or of any other escharotic.*

The best and most proper method of dividing the intestine, in the case of a collection of matter formed juxta anum, we have already described.

The intention to be aimed at by incision in the present case, is exactly the same, and ought to be executed in the same manner.

Let us first suppose the matter to be fairly formed; to have made its point, as it is called; and to be fit to be let out.

Where such point is, that is, where the skin is most thin, and the fluctuation most palpable, there the opening most certainly ought to be made, and always with a cutting instrument, not caustic, as was formerly done.

We have supposed the matter of the abscess to have been formed, and collected; but still to have been contained within the cavity, until let out by an incision.

We are now to consider it, as having made its own way out, without the help of art.

This state of the disease is also subject to some variety of appearance; and these different appearances have produced, not only a multiplicity of appellations, but a groundless supposition also, of a variety of essentially different circumstances.

When a discharge of the matter by incision is too long delayed or neglected, it makes its own way out, by bursting the external parts somewhere near to the fundament, or by eroding and making a hole through the intestine into its cavity; or sometimes by both. In either case, the discharge is made sometimes by one orifice only, and sometimes by more. Those, in which the matter has made its escape by one or more openings, through the skin only, are called *blind external fistulæ*; those, in which the discharge has been made into the cavity of the intestine, without any orifice in the skin, are named *blind internal*; and those, which have an opening both through the skin, and into the gut, are called *complete fistulæ*.

Thus, all these cases are deemed fistulous, when hardly any of them ever are so: and none of them necessarily. They are still mere abscesses, which are burst without the help of art; and, if taken proper and timely care of, will require no such treatment as a true fistula may possibly stand in need of.

The most frequent of all are what are called the *blind external*; and the *complete*. The method whereby each of these states may be known is, by introducing a probe into the sinus by the orifice in the skin, while the fore-finger is within the rectum: this will give the examiner an opportunity of knowing exactly the true state of the case, with all its circumstances.

Whether the case be, what is called a complete fistula, or not; that is, whether there be an opening in the skin only, or one there, and another in the intestine, the appearance to the eye is much the same. Upon discharge of the matter, the external swelling subsides, and the inflamed colour of the skin disappears, the orifice, which at first was sloughy and foul, after a day or two are past, becomes clean and contracts in size; but the discharge, by fretting the parts about, renders the patient still uneasy.

As this kind of opening seldom proves sufficient for a cure, (though it sometimes does) the induration, in some degree, remains; and if the orifice happens not to be a depending one, some part of the matter lodges, and is discharged by intervals, or may be pressed out by the fingers of an examiner. The disease, in this state, is not very painful; but it is troublesome, nasty and offensive: the continual discharge of a thin kind of fluid from it, creates heat, and causes excoriation in the parts above; it daubs the linen of the patient; and is, at times, very fetid; the orifice also sometimes contracts so, as not to be sufficient for the discharge; and the lodgment of the matter then occasions fresh disturbance.

The means of cure proposed and practised by our ancestors, were three, viz. caustic, ligature, and incision.

The intention in each of these is the same, viz. to form one cavity of the sinus and intestines by laying the former into the latter. The two first are now completely, and most properly, exploded.

Hitherto we have considered the disease either as an abscess, from which the matter has been let out by an incision, made by a surgeon; or from which the contents have been discharged by one single orifice, formed by the bursting of the skin somewhere about the fundament. Let us now take notice of it, when instead of one such opening, there are several.

This state of the case generally happens when the quantity of matter collected has been large, the inflammation of considerable extent, the adipose membrane very sloughy, and the skin worn very thin before it burst.—It is, indeed, a circumstance of no real consequence at all; but from being misunderstood, or not properly attended to, is made one of additional terror to the patient, and additional alarm to the inexperienced practitioner: for it is taught, and frequently believed, that each of these orifices is an outlet from, or leads to a distinct sinus, or hollow: whereas in truth, the case is most commonly, quite otherwise; all these openings are only so many distinct burstings of the skin covering the matter; and do all, be they few or many, lead and open immediately into the one single cavity of the abscess: they neither indicate, nor lead to, nor are caused by distinct sinuses; nor would the appearance of twenty of them (if possible) necessarily imply more than one general hollow.

If this account be a true one, it will follow, that the chirurgic treatment of this kind of case ought to be very little, if at all different from that of the preceding; and that all that can be necessary to be done, must be to divide each of these orifices in such manner as to make one cavity of the whole. This the probe-knife will easily and expeditiously do; and when that is done, if the sore, or more properly its edges, should make a very ragged, uneven appearance, the removal of a small portion of such irregular angular parts will answer all the purposes of making room for the application of dressings, and for producing a smooth, even cicatrix after the sore shall be healed.

When a considerable quantity of matter has been recently let out, and the internal parts are not only in a crude, undigested state, but have not yet had time to collapse, and approach each other; the inside of such cavity will appear large; and if a probe be pushed with any degree of force, it will pass in more than one direction into the cellular membrane by the side of the rectum. But let not the unexperienced practitioner be alarmed at this, and immediately fancy that there are so many distinct sinuses; neither let him, if he be of a more hardy disposition, go to work immediately with his director, knife, or scissars: let him enlarge the external wound by making his incision freely; let him lay all the separate orifices open into that cavity; let him divide the intestine lengthwise by means of his finger in ano; let him dress lightly and easily; let him pay proper attention to the habit of the patient; and wait, and see what a few days, under such conduct, will produce. By this he will frequently find, that the large cavity of the abscess will become small and clean; that the induration round about will gradually lessen; that the probe will not pass in that manner into the cellular membrane; and consequently, that his fears of a multiplicity of sinuses were groundless. On the contrary, if the sore be crammed or dressed with irritating, or escharotic medicines, all the appearances will be different: the hardness will increase, the lips of the wound will be inverted, the cavity of the sore will remain large, crude, and foul; the discharge will be thin, gleety, and discoloured; the patient will be uneasy and feverish: and, if no new cavities are formed by the irritation of parts, and confinement of matter, yet the original one will have no opportunity of contracting itself; and may very possibly become truly fistulous.

Sometimes the matter of an abscess, formed juxta anum, instead of making its way out through the skin, externally near the verge of the anus, or in the buttock, pierces through the intestine only. This is what is called a *blind internal fistula*.

In this case, after the discharge has been made, the greater part of the tumefaction subsides, and the patient becomes easier. If this does not produce a cure, which sometimes, though very seldom happens, some small degree of induration generally remains in the place where the original tumour was; upon pressure on this hardness, a small discharge of matter is frequently made per anum; and sometimes the expulsion of air from the cavity of the abscess into that of the intestine may very palpably be felt, and clearly heard; the stools, particularly, if hard, and requiring force to be expelled, are sometimes smeared with matter; and although the patient, by the bursting of the abscess, is relieved from the acute pain which the collection occasioned, yet he is seldom perfectly free from a dull kind of uneasiness, especially if he sits for any considerable length of time in one posture. The real difference between this kind of case, and that in which there is an external opening (with regard to method of cure) is very immaterial; for an external opening must be made, and then all difference ceases. In this, as in the former, no cure can reasonably be expected, until the cavity of the abscess, and that of the rectum, are made one; and the only difference is, that in the one case we have an orifice at, or near the verge of the anus, by which we are immediately enabled to perform that necessary operation; in the other, we must make one.

We come now to that state of the disease, which may truly and properly be called *fistulous.* This is generally defined, *sinus angustus, callosus, profundus; acri sanie diffluens:* or, as Dionis translates it, "*Un ulcère profond, & caverneux, dont l'entrée est etroite, & le fond plus large; avec issue d'un pus acre & virulent; et accompagné de callosités.*"

Various causes may produce or concur in producing such a state of the parts concerned as will constitute a fistula, in the proper sense of the word; that is, a deep, hollow sore, or sinus, all parts of which are so hardened, or so diseased, as to be absolutely incapable of being healed, while in that state; and from which a frequent, or daily discharge is made, of thin, discoloured sanies, or fluid.

These are divided into two classes, viz. those which are the effect of neglect, distempered habit, or of bad management, and which may be called, without any great impropriety, local diseases; and those which are the consequence of disorders, whose origin and seat is not in the immediate sinus or fistula, but in parts more or less distant, and, which, therefore, are not local complaints.

The natures and characters of these are obviously different by description; but they are still more so in their most frequent event, the former being generally curable by proper treatment; the latter frequently not so by any means whatever.

Under the former are reckoned all such cases as were originally mere collections of matter within the coats of the intestine rectum, or in the cellular membrane surrounding the said gut; but which, by being long neglected, grossly managed, or by happening in habits which were disordered, and for which disorders no proper remedies were administered, suffer such alteration, and get into such state, as to deserve the appellation of *fistulæ.*

Under the latter, are comprised all those cases in which the disease has its origin and first state in the higher and more distant parts of the pelvis, about the os sacrum, lower vertebræ of the loins, and parts adjacent thereto; and are either strumous, or the consequence of long and much distempered habits; or the effect of, or combined with other distempers, local, or general; such as a diseased neck of the bladder, or prostate gland, or urethra, &c. &c. &c.

Among the very low people, who are brought into hospitals, we frequently meet with cases of the former kind: cases, which, at first, were mere simple abscesses; but which from uncleanliness, from intemperance, negligence, and distempered constitutions, become such kind of sores, as may be called *fistulous.*

In these the art of surgery is undoubtedly, in some measure, and at some time, necessary; but it very seldom is the first or principal fountain from whence relief is to be sought: the general effects of intemperance, debauchery, and diseases of the habit are first to be corrected and removed, before surgery can with propriety, or with reasonable prospect of advantage, be made use of.

The surgery required in these cases, consists in laying open and dividing the sinus, or sinuses, in such manner that there may be no possible lodgment for matter, and that such cavities may be fairly opened lengthwise into that of the intestine rectum: if the internal parts of these hollows are hard, and do not yield good matter, which is sometimes the case, more especially where attempts have been made to cure by injecting astringent liquors, such parts should be lightly scratched or scarified with the point of a knife or lancet, but not dressed with escharotics; and if, either from the multiplicity of external orifices, or from the loose, flabby, hardened, or inverted state of the lips and edges of the wound near to the fundament, it seems very improbable that they can be got into such a state as to heal smooth and even, such portion of them should be cut off as may just serve that purpose. The dressings should be soft, easy, and light; and the whole intent of them to produce such suppuration as may soften the parts, and may bring them into a state fit for healing.

If a loose, fungous kind of flesh has taken possession of the inside of the sinus, (a thing much talked of, and very seldom met with) a slight touch of the lunar caustic will reduce it sooner, and with better effect on the sore, than any other escharotic whatever.

The method and medicines by which the habit of the patient was corrected, must be continued (at least in some degree) through the whole cure; and all these excesses and irregularities which may have contributed to injure it, must be avoided.

By these means, cases which at first have a most disagreeable and formidable aspect, are frequently brought into such state, as to give very little trouble in the healing.

If the bad state of the sore arises merely from its having been crammed, irritated, and eroded; the method of obtaining relief is so obvious, as hardly to need recital.

A patient who has been so treated, has generally some degree of fever; has a pulse which is too hard, and too quick; is thirsty, and does not get his due quantity of natural rest. A sore which has been so dressed, has generally a considerable degree of inflammatory hardness round about; the lips and edges of it are tumid, full, inflamed, and sometimes inverted; the whole verge of the anus is swollen; the hæmorrhoidal vessels are loaded; the discharge from the sore is large, thin, and discoloured; and all the lower part of the rectum participates of the inflammatory irritation, producing pain, bearing-down, tenesmus, &c. *Contraria contrariis* is never more true than in this instance: the painful, uneasy state of the sore, and of the rectum, is the great cause of all the mischief, both general and particular; and the first intention must be to alter that. All escharotics must be thrown out, and disused; and in lieu of them, a soft digestive should be substituted, in such manner as not to cause any distention, or to give any uneasiness from quantity; over which a poultice should be applied: these dressings should be renewed twice a day; and the patient should be enjoined absolute rest. At the same time, attention should be paid to the general disturbance, which the former treatment may have created. Blood should be drawn off from the sanguine; the feverish heat should be calmed by proper medicines; the languid and low should be assisted with the bark and cordials; and ease in the part must, at all events, be obtained by the injection of anodyne clysters of starch and opium.

If the sinus has not yet been laid open, and the bad state of parts is occasioned by the introduction of tents imbued with escharotics, or by the injection of astringent liquors, (the one for the destruction of callosity, the other for the drying up gleet and humidity) no operation of any kind should be attempted until both the patient and the parts are easy, cool, and quiet: cataplasms, clysters, rest, and proper medicines must procure this: and when that is accomplished, the operation of dividing the sinus, and (if necessary) of removing a small portion of the ragged edges, may be executed, and will, in all probability, be attended with success. On the contrary, if such operation be performed while the parts are in a state of inflammation, the pain will be great, the sore for several days very troublesome, and the cure prolonged or retarded, instead of being expedited.

Abscesses, and collections of diseased fluids are frequently formed about the lumbar vertebræ, under the psoas muscle, and near to the os sacrum; in which cases, the said bones are sometimes carious, or otherwise diseased. These sometimes form sinuses, which run down by the side of the rectum, and burst near to the fundament.

The chirurgic treatment of such sores and sinuses can have little influence on the remote situation, where the collection of matter is originally formed. (See *Lumbar Abscess.*)

Fistulous sores, sinuses, and indurations about the anus, which are consequences of diseases of the neck of the bladder, and urethra, called fistulæ in perinæo, require separate and particular consideration. (See *Fistula in Perinæo.*)

Pott may be considered as the source and authority of the foregoing remarks.

M. Roux has lately published a sort of critique on the preference, which English surgeons invariably give to Pott's method of operating for the fistula in ano. The chief peculiarity in the French plan, on which he bestows unqualified praise, consists in the use of a kind of director, called a gorget, which is usually made of ebony wood, and intended to be introduced within the rectum, with its concavity turned towards the fistula. A steel inflexible director, slightly pointed and without a cul-de-sac, is then passed through the fistula till the point comes into contact with the wooden gorget. A long, narrow-bladed, sharp-pointed, straight bistoury is now introduced along the groove of the steel director, till its point meets the groove of the ebony gorget, by cutting upon which all the parts are divided, which lie between the internal opening of the fistula and the anus. It may be objected to this method, that it is not always easy to make a director pass at once through the fistula into the rectum. This is acknowledged by M. Richerand, who adds, that, in this circumstance the point of the director may be forced forward into the rectum, without lessening the chance of the success of the operation. (*Nosogr. Chirurg. T.* 3, *p.* 463, 464, *Edit.* 4.) Why then does it matter so much that the surgeon sometimes pierces the rectum with the point of his curved bistoury? Surely, this is as good an instrument for making the puncture as the pointed director. Besides, it appears to me, that a flexible silver director is more likely to follow the track of the fistula into the rectum, than an unbending iron instrument. I shall say nothing of the awkwardness of using the other wooden director: the finger of the surgeon can always do the office of all such contrivances, with greater safety and convenience. M. Roux also censures us for not *cramming* the wound with charpie; for he is not content with merely introducing into it a dossil of lint. (See *Parallèle de la Chir. Angloise, &c. p.* 296, *&c.*) His countryman Pouteau, however, knew better long ago; for, he has expressed his decided conviction of the inutility of cramming the wound with dressings to its very bottom after the third day, and, after this period, he affirms, that superficial dressings, and the renewal of them as often as cleanliness requires, will be fully sufficient.

For information, relative to former opinions concerning *fistula in ano*, refer to *Celsus; Heister's Surgery; Le Dran's Operations; Sharp's Operations; La Faye's Notes on Dionis. In Kirkland's Medical Surgery, Vol.* 2, *may be found an account of the opinions and practice of many former celebrated practitioners. The best modern practical remarks are contained in Pott's Treatise on the Fistula in Ano, in which he has offered also an excellent critique on some opinions of Le Dran, De la Faye, and Cheselden. The reader may also consult with advantage Sabatier's Médecine Opératoire, Tom.* 2; *B. Bell's Surgery, Vol.* 2; *Latta's Surgery, Vol.* 2; *Richerand's Nosographie Chirurgicale, T.* 3, *p.* 446, *&c. Edit.* 4. *Roux, Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 296, *&c. Paris,* 1815. *Callisen's Syst. Chirurgiæ Hodiern. T.* 1, *p.* 470.

## ANUS, PROLAPSUS OF.

*Prolapsus ani*, technically called also *exania*, is a falling down of the inverted rectum, most frequently including the inner coats of the intestine, sometimes likewise the external coats. Occasionally, it contains a volvulus, or intussusception of a deeper portion of the intestinal tube, and it is subject to considerable variety in respect to length and thickness; when small resembling a mere ring; when large and reaching far downwards, having an oblong globular form. The tumour admits of reduction, except when in the incarcerated state. The disease occurs to persons of all ages; but it is most common in infants and elderly subjects. It may originate from different causes.

1. From circumstances, which tend to relax and weaken the parts, which retain the rectum in its situation.

2. From various kinds of irritation and pressure on the bowel itself, having the effect of increasing the powers, by which it is liable to be forced outward.

3. From causes operating on the adjacent parts, and affecting the rectum sympathetically.

Hence, a prolapsus ani may be caused by long habitual crying, and loud exertions of the voice; violent coughing; sitting long at stool; hard dry feces, and much straining to void them; diarrhæa; dysentery; chronic tenesmus; various diseases of the rectum itself; the abuse of aloetic medicines and emollient clysters; hemorrhoids; difficulty of making water; difficult labours; the stone in the bladder; paralysis; and prolapsus vaginæ.

Considering the degree of the disease, and the vehemence of the stricture, the symptoms are indeed sometimes mild, the rectum generally bearing exposure to the air and other irritations better than any other bowel. But the urgency and danger of a prolapsus ani are greater, when the swelling is large, recent, and conjoined with much spasm. When complicated with strangulation, serious consequences may follow; such as stoppage of the feces; severe pain, swelling, inflammation, and even gangrene within the cavity of the abdomen. In short, all the evils may arise, which are apt to attend a strangulated hernia. It is said, indeed, that by the manner in which the adjacent parts are sometimes drawn down, a real hernial swelling may be produced either through the stretched muscular fibres, or in consequence of the prolapsus of all the coats of the rectum. The prognosis, therefore, varies according to the different degree, species, cause, and complication of the disease. The recent, small, moveable prolapsus ani, which admits of its cause being removed, can be effectually and radically cured. It should always be recollected, however, that when once the rectum has been affected with prolapsus, it is always subject to be again protruded from any slight occasional cause. The habitual prolapsus, which happens to some persons whenever they go to stool, can hardly be cured by any mode of treatment.

The treatment of prolapsus ani embraces three grand indications.

1. The speedy reduction of the prolapsed part.

2. The retention of the reduced bowel.

3. The removal and avoidance of the causes, by which the disease is induced.

The reduction, in cases which are recent and not too voluminous, may in general be accomplished with tolerable ease, by putting the patient in a suitable posture, with the buttocks raised, and the thorax depressed, and by making gentle and skilful pressure, either with the palm of the hand, or fingers. The thing will succeed still more easily, when the bowel has been previously emptied by means of a mild unirritating clyster. In the habitual prolapsus ani, the patient himself is generally accustomed to reduce the part with ease. When, however, the inflammation and swelling are urgent, the part ought on no account to be irritated with repeated attempts at reduction. The practitioner should rather have recourse to the antiphlogistic plan, especially local bleeding, and mildly astringent saturnine washes; and when the swelling has been lessened, the reduction may be attempted again. When the reduction seems to be prevented by a spasmodic resistance, an anodyne poultice, a clyster of the same quality, and the internal use of opium, are the best means. Should the complaint not give way to the preceding remedies, and the symptoms become more and more pressing, the particular situation of the stricture should be examined with a probe, and divided either with a knife and director, or with a concealed bistoury. Some prefer the employment of a speculum ani; but on account of the globular form of the disease, it is certainly very difficult to apply it. Excrescences of the rectum are to be cured by the usual means. Cases are recorded, in which the part affected with gangrene, or with suppuration and hardness, has been removed with a knife, or ligature: the practice, however, does not merit imitation, and in the circumstance of gangrene, the measures, best calculated for stopping its course, detaching the sloughs, and keeping up the patient's strength, appear more prudent, than the operation.

The reduction having been effected, it is proper to introduce the forefinger up the rectum, in order to ascertain, that no intussusception exists above the anus within the sphincter. The bowel is then to be kept in its place by rest, and the application of a piece of sponge, or graduated compresses, supported with the T bandage. But if such means should not answer, and an habitual prolapsus ani should recur again and again, which is not unfrequent in the more common sort of case, the apparatus described by Mr. Gooch may be tried with more hope of success. (*Chirurgical Works, Vol. 2, p.* 150, *Edit.* 1792.) Others have used cones of ivory. Callisen found the introduction of a piece of sponge, within the rectum, fastened to a silver probe, give effectual support. In all probability pessaries made of elastic gum, like those invented by M. Bernard at Paris, would be the best of all contrivances. It cannot be denied, however, that all foreign bodies in the rectum create serious annoyance. In the female sex, a vaginal pessary, rather prominent behind, usually hinders the recurrence of a prolapsus ani.

The last indication in the treatment is the removal and avoidance of all such causes as are known to have a tendency to bring on the complaint. In infants, making them sit on a high close-stool, with their feet hanging freely down, will often prevent a fresh protrusion of the rectum. Every thing tending to cause either diarrhœa, or costiveness, should be avoided. The tone of the relaxed intestine is to be restored by the continued use of cold clysters, made with the decoction of oak bark, alum, and vinegar. Too much irritability of the rectum may be lessened with opium. Of the prolapsus ani, which is apt to arise from an artificial anus, we shall not here speak.

The intussusception of the higher part of the bowel, especially of the colon, or cœcum, causing a protrusion of the anus, is always incurable, as it is not in the power of art to rectify the displacement. Some extraordinary cases have evinced, however, that large portions of the intestinal canal may be separated and voided, and the patients recover. (*Callisen, Syst. Chirurgiæ Hodiernæ, T.* 2, *p.* 521—525.)

Before concluding, we may observe that surgical writers have been too much in the habit of confounding together prolapsus ani and intussusceptions. In the latter disease, they have even fallen into the error of supposing that the whole of the rectum becomes everted, in consequence of the relaxation of the sphincter and levatores ani, and, that it then draws after it other portions of the intestinal canal. But, they ought to have been undeceived by the strangulation, which sometimes occurs under such circumstances, and which not only throws a great obstacle in the way of the reduction of the displaced part, but even sometimes brings on mortification. Besides the connexions of the rectum with the neighbouring parts, by means of the cellular substance, which surrounds it, and the attachment of this intestine to the posterior surface of the urinary bladder, render the above origin of the complaint impossible. Such an explanation could only be admitted with regard to those protrusions of the rectum, which come on in a very slow manner. This account could not afford a satisfactory explanation of certain cases, in which the everted intestine presents itself in the form of an enormous tumour. Fabricius ab Aquapendente mentions his having seen tumours occasioned by a prolapsus of the rectum, which were as long as the forearm, and as large as the fist. In the *Mélanges des Curieux de la Nature,* we find an account of a tumor of this sort, which was two feet long, and occurred in a woman from parturition. Nor is a more satisfactory reason assigned for these cases, by supposing, that they originate from a relaxation of the villous coat of the rectum, and its separation from the muscular one. We are not authorized to imagine, that such a separation can take place to a considerable extent, nor so suddenly, as to give rise to the phenomena, sometimes remarked in this disease.

But more accurate observations have removed all doubt upon this subject. In the eleventh volume of the *Mémoires de l'Académie de Chirurgie, edit. in* 12*mo.* we read an account of a pretended prolapsus of the rectum, which, after death, was discovered to be an eversion of the cœcum, the greater part of the colon being found at the lower end of this intestine, and most of the rectum at its upper part. This eversion began at the distance of more than eleven inches from the anus, and terminated about five or six from this opening, the tumour, formed by the disease, having been reduced some time before the child's death. It was impossible to draw back the everted part, in consequence of the adhesions, which it had contracted. Another dissection has evinced the same fact. A child, having suffered very acute pain in the abdomen, after receiving a blow, had a prolapsus of intestine through the anus, about six or seven inches long. This was taken for a prolapsus of the rectum. After death, the termination of the bowel out of the anus was found to be nothing less, than the cœcum, which had passed through the colon, and rectum, and made a protrusion at the anus. See *Intussusceptio.* For information on the preceding subject, the reader may consult with advantage: *l'Encyclopédie Méthodique, Partie Chirurgicale, De la chûte du fondement, Tom.* 1, *p.* 150. *Gooch's Chirurgical Works, Vol.* 2, *p.* 150. *Edit.* 1792. *Récherches Historiques, sur la Gastrotomie, ou l'ouverture du bas-ventre, dans le cas du Volvulus, &c. par M. Hevin in Mém. de l'Acad. Royale de Chirurgie, Tom.* 11, *p.* 315. *Edit. in* 12*mo. Richerand's Nosographie Chirurgicale, Tom.* 3, *p.* 444, *Edit.* 4, *&c. Richter's Anfangsgrunde der Wundarzneykunst, Band* 6, *Von dem Vorfalle aus dem Hintern, p.* 403. *Edit.* 1802. *Callisen's Syst. Chirurgiæ Hodiernæ, T.* 2, *p.* 521, *Edit.* 1800.

### ANUS, ARTIFICIAL.

This signifies an accidental opening in the parietes of the abdomen, to which opening some part of the intestinal canal tends, and through which the feces are, either wholly, or in part, discharged.

When a strangulated hernia occurs, in which the intestine is simply pinched, and the case is not understood; when the occurrence has not been relieved by the usual means; or when the necessary operation has not been practised in time; the protruded part becomes gangrenous, and the feces escape. Putrefaction takes place in the cellular substance, and under the adjoining integuments, while the gangrenous affection of the tumour spreads from within outward. One or more openings soon form in the mortified parts, and through these apertures the feces are discharged, until the separation of the sloughs gives a freer vent to the excrement. But if the patient should be at last operated upon, his feces are discharged through the wound, and the intestines are more easily emptied. In both cases, the excrement continues to be discharged from the opening, when the loss of substance in the intestine is great, and a considerable contraction of the bowels has taken place below the part affected. When the mortification has been too extensive, and the cicatrix, following the detachment of the dead parts, has greatly diminished the diameter of the bowels, the feces more readily pass out of the wound, than along the intestinal canal, and, consequently, they are entirely discharged through the artificial opening. In this way, an artificial anus is formed, through which the excrement is evacuated during life.

The same occurrence may follow wounds, penetrating the abdomen, and doing considerable injury to the intestines. The inflammation, which always accompanies such wounds, occasions salutary adhesions, between the edges of the divided intestine and those of the opening in the peritoneum and muscles. This prevents any extravasation of matter in the abdomen. The fixed and permanent situation of the large intestines renders all wounds, occurring to them, much more prone, than those befalling the small intestines, to this consequence, so favourable in many respects. However, artificial ani have been known to form after wounds of the small intestines. A case of this sort may be perused in Fernel, and a second in Bauhin. (*Sabatier sur les Anus contre Nature, in Mem. de l'Acad. de Chir. Tom.* 5. *Edit. in* 12*mo.*)

In cases of hernia with gangrene, an artificial anus is formed, under the above circumstances, according to the design of nature, and it would frequently be wrong to hinder the occurrence, even though it were practicable to heal the wound, which is the situation of it. For, the intestine being too much contracted at the place of the cicatrix, the patient would continue subject to cholic complaints. In this manner, he might be put into more or less immediate danger of perishing from a bursting of the intestinal canal within the abdomen, or else from a simple obstruction in the cavity of the bowels. This is not the case, when an artificial anus is formed, in consequence of a wound of the intestines, and, if the patient could receive timely succour, before such a consequence had completely taken place, possibly, the event might often be prevented.

Howsoever advantageous the formation of an artificial anus may be, in many cases, in which the patient's life depends upon the event, it must be confessed, that the consequence is a most afflicting and disgusting infirmity. It is true, however, that the feces, which are discharged, not having been long retained in the bowels, are not so fetid as those which are evacuated in the ordinary way; but, as the opening which gives vent to the matter is not endued with the same organization as the lower end of the rectum, and, as in particular, it is not furnished with any sphincter capable of contracting and relaxing itself, as occasion requires, the feces are continually escaping without any knowledge of the circumstance on the part of the patient. Some persons in this state, among the number of those whose histories are on record, have made use of a metal box, in which their excrement has been received. Schenckius relates the case of an officer, who was wounded in the belly, and who allowed his feces to escape into a vessel made for the purpose. Dionis makes mention of a similar case. What occurred to an invalid soldier, says this eminent writer, is too singular to serve as an example in practice, since nature alone preserved him, by making the wound of the abdomen serve as an opening for the discharge of his feces. The intestine has become adherent to it, and he daily evacuates his excrement through this opening. The matter coming away involuntarily, necessitates him to have a tin-box for its reception.

M. Moscati, principal surgeon of the hospital at Milan, has also communicated to the academy of surgery, an account of a wounded man, in whom an artificial anus took place, in consequence of a wound in the abdomen below the right hypochondrium. His excrement used also to be received in a tin-box, fastened to him by a belt. The above surgeon very properly remarks, as a truly singular circumstance in this wound, that it admitted of a leaden cannula being introduced, to which cannula the tin-box was accommodated. But, would the situation of wounds, liable to be followed by an artificial anus, be always sufficiently favourable, to allow of the intestinal matter being received in an appropriate vessel? May not the pressure, which the edges of such vessels are apt to make on the circumference of the opening, be detrimental? Lastly, would not such a vessel, though apparently fixed in a suitable manner, change its position, and sometimes allow the feces to escape on the patient's clothes?

Uncleanliness is not the only inconvenience of an artificial anus. Persons have been known to be quite debilitated by the affliction, and even ultimately to die in consequence of it. This is liable to happen, whenever the intestinal canal is opened very high up, so that the aliment escapes before chylification is completed, and the nutritious part of the food has been taken up by the lacteals. But, when the opening only interests the lower circumvolutions of the ilium, or, what is more frequent, when it has occurred in the large intestines, the danger, to which the patient is exposed by this event, is rendered very trivial. There is no fact of this kind recorded, which had a fatal termination; on the contrary, many writers certify, that such patients as they have seen with an artificial anus, have been healthy and well-looking.

The most grievous occurrence, to which persons with an artificial anus are exposed, is a prolapsus of the bowel, similar to what sometimes happens through the anus, with respect to the rectum. The descent of the bowel is sometimes simple, only affecting a portion of the intestinal canal just above or below the opening. On other occasions the complaint is double, the bowel both above and below the opening being prolapsed. This descent of the intestine forms a tumour, the dimensions of which vary considerably in the different subjects in whom it is observed. When the protrusion is caused by the upper part of the intestinal canal, the feces are voided at the extremity of the tumour, and, when the swelling consists of the lower portion of the bowel, the excrement is evacuated at the base of the prolapsed part.

When the tumour is double, it is easy to perceive, by observing this evacuation, to which end of the intestinal canal each protruded portion belongs. This consequence of an artificial anus is very serious, because it greatly increases the inconvenience, which the patient suffers. Sometimes, the tumour is exquisitely sensible; and, occasionally, when the eversion of the intestine is considerable, a strangulation is produced, which puts the patient's life in danger, unless prompt assistance be afforded.

The business of the surgeon is to prevent, if possible, the formation of an artificial anus, as we shall see elsewhere; but, when the event has occurred, and, particularly, when the whole or the greater part of the stools are discharged in this way, no attempt can be made to stop up the opening without exposing the patient's life to the most alarming danger. Even when a considerable quantity of the feces is discharged in the natural manner, it is always to be presumed, that the bowel is very much contracted at the place, where it communicates with the wound, and that the intestine will be liable to inflame, when an unusual accumulation of its contents has taken place, unless they have an opportunity of escaping through the external opening. Such an occurrence would be likely to bring on a train of bad symptoms, under which the patient might soon sink.

But, if it is dangerous to close an artificial anus, when the case is of the most simple description, the thing is absolutely impracticable, when the affliction is complicated with an everted prolapsus of a part of the bowel; although we read in the Philosophical Transactions, that M. Le Cat undertook such an operation, in a case, in which there was an eversion of each portion of the intestinal canal.

But the pain which he gave the patient in endeavouring to reduce the protruded intestine, induced him to abandon all further attempts. If, also, in such a case, it were easy to reduce the displaced portions of intestine, and if that, which is connected with the rectum, were nearly of its natural diameter, (a circumstance not to be expected,) prudence would not allow us to place these portions opposite each other, for the sake of re-establishing the continuity of the canal. The number and depth of the adhesions, which the intestines may have contracted with each other, and the neighbouring parts, are likely to render such an operation impracticable. It would also be terrible to make an unsuccessful attempt of this kind, and to plunge into imminent peril, a person in other respects quite well, and who, with the exception of some inconvenience, may enjoy life as well as subjects of the best constitutions.

Though we cannot remedy these eversions of the intestine, when the tumour is large, and of long standing; yet, there is a possibility of affording relief, when the swelling is small and recent. In this circumstance, skilful treatment would probably hinder the progress of the disorder, and even effect an entire cure. The treatment must obviously be very similar to that of the prolapsus ani, for both complaints are of the same nature. The practitioner should endeavour gently to return the tumour into the abdomen, and to retain it there by means of a soft pad of suitable size. This pad should be frequently changed, on account of the discharge. As posture must greatly tend to bring about a cure, the patient should be recommended to lie, as much as possible, on the side opposite the disease. He should be enjoined to make no violent exertion, which would put the abdominal muscles and diaphragm into action, and force the intestines through the external opening. If there be any difficulty in evacuating the feces from the artificial anus, the belly should be kept gently open. The parts in the vicinity of the artificial anus should be strengthened by slightly astringent fomentations, &c. It might also be useful to support the margin of the opening by an ivory or elastic-gum compress, if the patient should void feces of a thick consistence, and should feel, before the evacuation, the kind of inclination which precedes the discharge of the feces in the natural way.

Thus, by advice, which is both simple and easy to follow, a grievous affliction may be prevented; and one which would expose the patient to the most pressing danger, were the swelling, to which the intestines protruded from an artificial anus are subject, to acquire such a size, that the bowels themselves become strangulated in the opening, through which they pass. (*Encyclopédie Méthodique; Partie Chirurgicale. Art. Anus contre Nature.*)

Mr. Lawrence has made some accurate remarks on the present subject, and he has also related the particulars of a case of artificial anus, which convey much instruction.

"If the complaint (a mortified hernia) terminates in the formation of an artificial anus, we must endeavour to alleviate those distressing inconveniences, which arise from the involuntary discharge of wind and feces through the new opening, by supplying the patient with an apparatus, in which these may be received, as they pass off. An instrument of this kind, the construction of which appears very perfect, is described by Richter (*Anfangsgr. der Wundarzn. Vol. 5.*) from the *Traité des Bandages* of Juville. The patient will be best enabled to adapt any contrivance of this sort to the particular circumstances of his own case. It has been found, in some instances, that a common elastic truss, with a compress of lint under the pad, has been more serviceable than any complicated instrument (*Parisian Journal, Vol. 1. p. 193.*) in preventing the continual flow of feculent matter from the artificial opening." (*Treatise on Hernia, p. 206. First edition.*)

"I know," says Mr. Lawrence, "a patient with an artificial anus, in whom the gut often protrudes to the length of eight or ten inches, at the same time bleeding from its surface. This is attended with pain, and compels him to lie down; in which position the intestine recedes. The patient has now discharged all his feces at the groin for fifteen years; and has enjoyed tolerable health and strength during that time. His evacuations are generally fluid; but sometimes, of the natural consistence. Whenever he retains his urine, after feeling an inclination to void it, a quantity of clear inoffensive mucus, like the white of an egg, amounting to about four ounces, is expelled from the anus; and this may occur two or three times in the day." (*P. 208.*)

When the protruded intestine is strangulated, an operation may become necessary for the removal of the stricture. (*Schmucker Vermischte Chirurgische Schriften, Tom. 2.*) Two cases, which terminated fatally from this cause, are mentioned by Sabatier, in a memoir in the 5 Tom. de l'Acad. de Chir. Mr. Lawrence also refers to Le Blanc Précis d'Opérations, de Chir. Tom. 2. p. 445. We should always endeavour to prevent such protrusions, when a disposition to their formation seems to exist, by the use of a steel truss, which should, indeed, be worn by the patient independently of this circumstance. If the tumour has become irreducible by the hand, an attempt may be made to replace it by keeping up a constant pressure on the part, the patient being at the same time confined to bed. By these means, Desault (*Parisian Journal, Vol.* 1. *p.* 178.) returned a very large prolapsus, and, by pressure on the opening, the feces were made to pass entirely by the anus although, for four years, they had been voided only through the wound. (*Lawrence, p.* 209, 210.)

In cases of mortified hernia, the wound sometimes closes, except a small fistulous opening, which discharges a thin fluid, and cannot be healed. Mr. Lawrence has related, in his excellent treatise on hernia, a case, in which the feces came from the wound sometime after an operation, although the bowel did not appear gangrenous when this proceeding was adopted. (*P.* 211.)

In the appendix to this work, the author adds some further account of the case of artificial anus, which he has related (*P.* 208.) The man is sixty years of age, and appears to be healthy, active, and even younger, than he really is. He had had a scrotal hernia, which ended in mortification, and involved the testicle of the same side, and a large portion of the integuments, in the destruction. It is now nearly seventeen years since this event, and the feces have during all this time been discharged from the groin. He has never made use of a truss, nor taken any step, except that of always keeping a quantity of tow in his breeches.

The prolapsed portion of intestine varies in length and size at different times. It was four inches long when Mr. Lawrence saw it, and the basis, which is the largest part, measured nearly six inches in circumference. The prolapsus never recedes entirely, and it has occasionally protruded to the length of eight or ten inches, being as large as the forearm, and emitting blood. This occurrence is painful, and only comes on when the bowels are out of order. Warm fomentations, and a recumbent position, afford relief, and accomplish a reduction of the bowel.

The projecting part is of an uniform red colour, similar to that of florid and healthy granulations. The surface, although wrinkled and irregular, is smooth, and lubricated by a mucus secretion. It feels firm and fleshy, and can be squeezed and handled, without exciting pain. The man has not the least power of retaining his stools. When these are fluid, they come away repeatedly in the course of the day, and with considerable force. When of a firmer consistence, there is only one stool, every one or two days, and the evacuation requires much straining. Such feces are not broader than the little finger. When the patient is purged, the food is often voided very little changed. This is particularly the case with cucumber. In this state he is always very weak. Ale is sometimes discharged five minutes after taken, being scarcely at all altered. The bowels are strongly affected by slight doses of purgatives. (*Lawrence, in Treatise on Hernia.*)

Consult *Sabatier in Mém. de l'Acad. de Chirurgie, Tom.* 5, 4*to. and in Médecine Opératoire, Tom.* 2. *L'Encyclopédie Méthodique, Partie Chirurg. Richter's Anfangsgr. der Wundarzn. Band* 5. *Parisian Chirurgical Journal. Œuvres Chirurg. de Desault par Bichat, Tom.* 2. *Schmucker's Chirurgische Schriften, Vol.* 2. *Lawrence's Treatise on Hernia. Callisen's Systema Chirurgiæ Hodiernæ, T.* 2, *p.* 710, &c.

**AORTA.** Aneurisms of this vessel have already been treated of; but, there are a few other particulars, relating to this important artery, which seem to merit notice in a dictionary of surgery, and can only be conveniently mentioned in the present place.

### WOUND OF THE AORTA NOT ALWAYS FOLLOWED BY INSTANTANEOUS DEATH.

A case, exemplifying this fact, has been lately recorded by M. Pelletan. In the month of May, 1802, a young military man, of middling strength, applied at the Hôtel-Dieu. In a duel, he had been run through with a foil, which penetrated above the right nipple, and came out at the left loin. The most alarming symptoms were apprehended; but, several days elapsed without any serious complaints taking place. The patient was bled twice, and kept on a very low regimen. Every thing went on quietly for a fortnight. He now complained of severe pains in his loins, and he was relieved by the warm bath. He seemed to be recovering, got up and went to walk in the garden allotted for the sick; but, the pain in his loins quickly returned, attended with difficulty of breathing, constipation, and wakefulness. He became very impatient and out of temper with the surgeons for not relieving him.

On the 15th of July, two months after the accident, a deformity of the spine was remarked about the eighth dorsal vertebra. The patient grew rapidly worse, and died in the utmost agony, saying that he felt suffocated, and tearing off his shirt that his chest might be free from the pressure of all kinds of clothing.

On the body being opened, the right side of the chest was found full of blood, coagulated in various degrees, and an opening, the diameter of which was equal to that of a writing pen, was detected in the aorta above the crura of the diaphragm. All the adjacent cellular substance was injected with blood, and three of the dorsal vertebræ were found carious. No mark of injury was perceptible in any of the thoracic or abdominal viscera. (See *Pelletan's Clinique Chirurgicale, Tom.* 1, *p.* 92—94.)

### THICKENING AND CONSTRICTION OF THE AORTA.

Meckel met with two cases, in which the aorta was thickened and considerably constricted, just below its arch; yet, in both subjects, there was every reason to believe, that the abdominal viscera and lower extremities had been duly supplied with blood.

This fluid, which could only pass from the heart with great difficulty, and in small quantities, had, by regurgitating, lacerated the semilunar valves. (*Mém. de l'Acad. Royal. de Berlin,* 1756. *Obs.* 17 *and* 18.) A like example is recorded by Stoerk. (*Ann. Med.* 11. *p.* 171.)

### OBLITERATION OF THE CAVITY OF THE AORTA.

It is observed by Professor Scarpa, that the whole body may be regarded as an anastomosis of vessels, a vascular circle, and he contends, that this remark is so true, than even an obliteration of the aorta itself, immediately below its arch, may take place, without the general circulation of the blood in the body being stopped. Such a disease of the aorta was seen by M. Paris in the body of a woman. While she lived, the blood, which was expelled from the heart, was transmitted into the trunk of the aorta, below the constriction, and it got there by passing through the subclavian, axillary, and cervical arteries, into the mammary, intercostal, diaphragmatic, and epigastric arteries. From these latter arteries, the blood passed into the vessels of the thoracic and abdominal viscera, and those of the lower extremities. (See *Desault's Journal, Tom.* 2, *p.* 107.)

Dr. Graham, of Glasgow, has recently published another example, in which the aorta was completely obstructed. The particulars are detailed in the *Medico-Chirurgical Trans. Vol.* 5, *p.* 287.

### RUPTURE OF THE AORTA WITHIN THE PERICARDIUM.

The surgical writings of Scarpa, in relation to the formation of aneurisms, have now gained extensive celebrity in the world. It is well known, that this author maintains the doctrine, that, in all aneurisms, the internal and muscular coats of the artery are ruptured, and that the aneurismal sac is not formed of these tunics, but of the dilated cellular sheath, which surrounds the vessel. When a large aneurism bursts, there is always a double rupture; one of the artery; another of the aneurismal sac. The last is that, which is the immediate cause of the patient's destruction, by altering the *circumscribed* state of the aneurism into the *diffused.*

There are some exceptions, however, to the foregoing statement, and Scarpa has not failed to point them out. When the internal and muscular coats of the aorta are ruptured in a situation, where the outside of the vessel is only covered by a thin, tense, closely adherent membrane, such membrane may be ruptured at the same time with the proper coats of the artery, and sudden death be occasioned by the effusion of blood in the cavity of the thorax. These events are liable to happen, whenever the proper coats of the aorta are ruptured, within the pericardium, where the vessel is only covered with a thin layer reflected from this membranous bag. Walter has recorded one example of this kind, and Morgagni several others. A similar case is related by Scarpa. (See *Haller Disput. Chir. Tom.* 5. *Acta Medic. Berlin. Vol.* 8, *p.* 86. *Morgagni de Sed. et Causis Morb. Epist.* 26, *art.* 7. 17. 21. *Epist.* 27, *Art.* 28. *Scarpa on Aneurism, transl. by Wishart, p.* 81. *Also Hodgson on the Diseases of Arteries and Veins.*)

### STEATOMATOUS TUMOURS OF THE AORTA.

Two steatomatous tumours were noticed by Stenzel in the body of a male subject. They were situated in the substance of the membranes of the aorta, immediately below its arch. Notwithstanding these swellings rendered the vessel almost impervious, the man had the appearance of strength, and of having been well nourished. *Hæc corpora fere cor magnitudine æquabant ut omnem propemodum exeunti e sinistri cordis thalamo sanguini spatium præcluderent.* Dissert. de Steatomatibus Aortæ.

This is another striking fact illustrating the great power of the inosculations to carry on the circulation.

APHÆRESIS. (from *αφαιρεω*, to remove.) This term was formerly much used in the schools of surgery, to signify that part of the art, which consists in taking off any diseased, or preternatural, portion of the body.

APONEUROSIS. (*απο*, from, and *νευρον*, a nerve.) The expression νευρον was applied by Hippocrates and other ancient writers to tendons and ligaments as well as nerves, all which parts seemed to resemble each other in having a white fibrous texture.

Matter very often collects under aponeuroses in different situations of the body, particularly, under the tendinous expansions, which cover the muscles of the thigh, the leg, and the forearm. Abscesses are also sometimes met with under the temporal, the palmar, and the plantar fasciæ; in the tendinous thecæ, which include the flexor tendons of the fingers; and, occasionally, also, in the aponeurotic sheath, in which the rectus abdominis muscle is situated.

One particular effect of an aponeurosis, or any kind of tendinous expansion, lying between a collection of matter and the skin, is materially to retard the progress of the pus towards the surface of the body. Hence, if the case be allowed to take its own course, the quantity of matter increases, the pus spreads extensively under the aponeurosis in every possible direction, separates the muscles from such fascia, and the muscles from each other, and the abscess does not burst till a vast deal of mischief has been produced, together with more or less sloughing of the fascia, tendons, &c. These circumstances cannot happen, without a considerable degree of constitutional disturbance, and a permanent loss of the use of certain muscles. Even when a spontaneous opening is formed, and some of the matter escapes, it is often only a very imperfect discharge; for, the aperture generally occurs, not in a depending situation, nor over the main collection of pus, but, at a part, where the aponeurosis is most thin, and, consequently, where the matter had the least resistance to overcome in getting to the surface of the body.

The grand indication, in all such cases, is to make an early and a depending opening with a lancet, so as to prevent the extension of concealed mischief, and to let the matter escape as fast as it is formed. If a spontaneous opening should have occurred in an unfavourable place, a new aperture must be made in a proper situation; or if the former should be sufficiently depending and near the principal accumulation of matter, but too small, it must be rendered larger with a curved bistoury and a director. In every instance, in which an opening has been made, or enlarged, with a cutting instrument, it will be necessary to keep some lint between the lips of the incision, for the first few days, in order to prevent the part from healing up by the first intention. The lint must be occasionally taken out for the purpose of letting the matter flow out, and a fresh bit be afterwards introduced. Whenever any black dead pieces of fascia, or tendons, present themselves at the opening, they must be taken hold of with a pair of forceps, and extracted.

**APOSTEMA.** (from αφιςημι, to recede.) An abscess.

**APPARATUS.** This implies the preparation, and arrangement of every thing necessary in the performance of an operation, or in the application of dressings. The apparatus varies according to circumstances. Instruments, machines, bandages, tapes, compresses, pledgets, dossils of lint, tents, &c. are parts of the apparatus, as well as any medicinal substances used.

It is a rule in surgery, to have the apparatus ready before beginning an operation. All preparations of this kind should not be made in the patient's room when the thing can be avoided, nor any where in his presence, as it might agitate him, and render him timid, and more restless in the operation.

We have been lately censured by a French surgeon, for our too common neglect of what has been here recommended. "In France (observes M. Roux) we are careful not to let a patient, who is to undergo a serious operation, see any of the requisite preparations for it. We hasten as much as possible the immediate preparatory measures, in order not to prolong unnecessarily the restlessness and moral agitation, which the expectation of an operation, and sometimes of the slightest one, always produces. These precautions are neglected by the English surgeons, at least, by most of those, whom I saw operate. They even neglect them in private practice, where we have commonly to deal with, more than in hospitals, pusillanimous individuals, who are easily alarmed, and whose extreme susceptibility it is of importance to spare. It was in the very room, where the patient lay, of course under his eyes, that the table, and all the necessary instruments for lithotomy, were arranged, at an operation, which I saw done in London, during my stay in that capital, by one of the men, who at this moment holds the sceptre of surgery there." (See *Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 105.)

M. Roux in his visit to London had too good reason also to complain of the slovenly objectionable practice of leaving the application of the tourniquet, and the dressing of the wound after a surgical operation, to mere novices and students. I entirely coincide with him, that, in respect to the dressings in particular, a surgeon is bound to extend his attention and solicitude a little beyond the moment when the operation terminates.

**APPARATUS MINOR; APPARATUS MAJOR; APPARATUS ALTUS.** Three ways of cutting for the stone. (See *Lithotomy.*)

AQUA AMMONIÆ ACETATÆ. (LIQUOR AMMON. ACET. L. P.) This is given in the dose of half an ounce in many surgical cases, in which the object is to keep up a gentle perspiration.

AQUA ARSENICATA.

℞ Arsenici in pulverem triti unc. ss.
Aquæ distillatæ lib. j.

These are to be boiled together in a flask till one-fourth of the liquor is evaporated, and, when cold, filter the remainder through paper by means of a glass funnel. Has been applied to foul ulcers and cancers.

AQUA CALCIS. (LIQUOR CALCIS, L. P.) This is sometimes used as an astringent injection, or lotion, in cases of gonorrhæa, gleet, psora, tinea capitis, abscesses, &c.

AQUA CUPRI SULPHATIS CAMPHORATA.

℞ Cupri sulphatis.
Boli Gallici sing. unc. ss.
Camphoræ drach. j.
Aquæ ferventis lib. iv.

Boiling water is to be added to the other ingredients, and the liquor filtered when cold. Is chiefly employed in a diluted state, as a collyrium; but it may also prove of service as an application to foul ulcers.

When used for the cure of the purulent ophthalmy, the lotion is to be injected under the eyelids by means of a blunt syringe, and, if necessary, the application may be repeated once or twice every hour. Some further particulars will be offered in the article *Ophthalmy.*

AQUA KALI. (LIQUOR POTASSÆ SUBCARBONATIS, L. P.) No adequate trial of this as an external application to ulcers or herpetic eruptions has yet been made; but, in the dose of 40 drops night and morning, Mr. Hunter thinks it cures some sores, resembling mild chancres, which were unaltered by the internal use of mercury and irritated by its use as a topic.

This remedy is principally deserving of notice on account of its having been given with a view of dissolving calculi in the bladder, so as to remove the necessity of performing the dangerous and painful operation of lithotomy. The principle, on which the aqua kali acts is by the alkali attracting and combining with the uric acid of the calculus. The medicine may be exhibited in doses of 20 or 40 drops, or of a dram, in a basin of gruel. Experience does not seem to justify the indulgence of much hope, with regard to the complete efficacy of the aqua kali in dissolving urinary calculi; but, there is no doubt, that it has often materially palliated the pain, which attends the presence of a stone in the bladder.

Some practitioners place more confidence in the aqua kali puri.

AQUA KALI ARSENICATI.

℞ Kali Arsenicati grana duo.
Aquæ Menthæ Sativæ uncias quatuor.
Spiritus Vinosi tenuioris unciam.
Misce et cola.

Two drams of this may be given thrice a day in cases of cancer. Mr. Barnes once shewed me a case of herpes of the nose, or noli me tangere, which was greatly benefited by this remedy externally applied. The patient was under Sir L. Harvey, in St. Bartholomew's Hospital, and, at the time when I saw her, Mr. Barnes was using the lotion with double the proportion of arsenic. There are many ulcerations round the roots of the nails of the fingers and toes, to which many apply Plunket's caustic; but, the aquæ kali arsenicati would, in all probability, be quite as efficacious an application, and, certainly, it is a neater one.

AQUA KALI PURI. (LIQUOR POTASSÆ, L. P.) This has been given with a view of dissolving urinary calculi, in considerable doses, for a length of time. The trials, however, have not proved so successful as could have been wished, nor is the exhibition of so active a remedy unattended with disadvantageous consequences to the system; for which reason, under the name of *mephitic alkaline water*, vegetable alkali supersaturated with fixed air, has of late been much substituted.

The proper dose, at first, is from ten to twenty drops, twice a day, in some linseed tea. At Saint Thomas's Hospital, the following is the way, in which the aqua kali puri is prescribed:

℞ Aquæ Kali puri ℥i.
Aquæ Distillatæ ℥ij. Misce. Dosis Drachma una bis die ex unciis quatuor infusi lini.

AQUA LITHARGYRI ACETATI, (LIQUOR PLUMBI ACETATIS, L. P.) Is extensively used largely diluted with water, as an application to inflamed parts. One dram to a quart of water is quite strong enough for common purposes. Mr. Justamond and Dr. Cheston used to apply it mixed with an equal proportion of a spirit resembling the tinctura ferri muriati, to the edges of cancerous sores.

The fear of the absorption of lead, has induced many practitioners to give up the use of this remedy, and have recourse to solutions of vitriolated zinc, which, it is said, answer equally well; but it is now rendered probable, from the experiments of Mr. Baynton, of Bristol, that cold water alone is of as much service as either in removing inflammation. (See *Pharmacopœia Chirurgica.*)

AQUA PICIS. May be applied to tinea capitis. There are ulcers on the legs, surrounded with a scorbutic redness, and pimples, covering a large extent of the skin. In such instances, the aqua picis, used as an application round the limb, over the dressings, is of great service.

**AQUEOUS HUMOUR OF THE EYE.** The proposal of letting out this fluid, and the circumstances, in which such an operation may be proper, will be considered in the article *Ophthalmy.*

**ARDOR URINÆ.** Difficulty and pain in making water, attended with a sense of heat in the urethra, a symptom of gonorrhea, and some other affections.

**ARGEMA, or ARGEMON.** (from αργος, white.) A small white ulcer of the globe of the eye. (See *Cornea, ulcers of.*)

**ARGENTI NITRAS.** (*Nitrate of silver, lunar caustic.*) Is the best of the mildest caustics. Its utility for stimulating indolent ulcers, and keeping granulations from rising too high, is known to every one.

Mr. Hunter recommends the use of the argentum nitratum, on the first appearance of a chancre, before absorption can be supposed to have taken place. He directs the caustic to be scraped to a point, like a blacklead pencil; so that, when it is applied, every part of the surface of the chancre may come into contact with it; and he advises the repetition of this process, till the last slough, which is thrown off, leaves the sore florid and healthy. (*Hunter on the Venereal.*)

From this treatment, there is a chance, that the constitution will not be infected; but it is generally prudent, notwithstanding, to give the pil. hydrargyri.

The important use of the argentum nitratum, in the cure of numerous diseases, we shall have occasion to remark in various places of this work; particularly when we come to the article *Cornea, ulcers of; Iris, prolapsus of; Ulcers; Urethra, strictures of, &c.*

The argentum nitratum is often used in the form of a solution, in the proportion of a dram of the caustic to an ounce of distilled water. In general this application ought to be at first more or less weakened, by the addition of a quantity of distilled water. Cancerous ulcers, and sores about the nose and neighbouring parts of the face, commonly going under the denomination of *noli me tangere*, are often considerably benefited by the argentum nitratum, both in the solid and fluid state. The solution agrees very well with certain sores, which occur round the roots of the nails of the fingers and toes. The lotion is sometimes applied with a camel-hair pencil; in general, however, by dipping little soft bits of lint in the fluid, laying them on the part, and covering them with a pledgit.

**ARNICA.** (αρνικη, from αρς, a lamb.) *Leopardsbane.*

Amaurosis is the principal case in which surgeons now ever employ this medicine. From a dram to half an ounce of the flowers may be infused in a pint of water, and this may be taken in the course of four and twenty hours. Arnica, thus exhibited, sometimes produces vomiting, profuse perspiration, and an increased secretion from the kidneys. At other times, no evident effects of this sort arise. The virtues of this medicine have undoubtedly been exaggerated, though no one can question that, as it is a powerful one, the trial of it should still be continued.

**ARSENIC.** (from the Arabic *Arsanek*, or αρσην, *masculus*, from the strength of its qualities.) Every one is acquainted with the deleterious effects of this mineral, which, in the dose of a few grains, acts as the most violent poison. Notwithstanding such effects which are generally dreaded, practitioners have ventured to employ arsenic as a remedy for diseases, and this has sometimes been done with success, not only as an external topical application, but, even as an internal medicine.

Arsenic is the principal ingredient of a secret remedy, which, in Ireland, has long possessed very great celebrity for the cure of cancer, and which is known by the name of Plunket's caustic. This application is said to consist of the ranunculus acris, the greater crow-foot, the flammula vulgaris, and the lesser crow-foot: an ounce of each is to be bruised, and added to a dram of arsenic, and five scruples of sulphur. The whole is to be beaten into a paste, formed into balls, and dried in the sun. When used, they are to be beaten up with the yolk of an egg, and applied on a piece of pig's bladder. The use of the ranunculus is to destroy the cuticle, on which the arsenic does not act. The application is to remain on twenty-four hours, and, the slough is to be afterwards dressed with any simple, unirritating ointment. Arsenic seems to have been first recommended as an external application to cancers, and it was generally combined with opium. It certainly sometimes produces a salutary change in the appearance of the sore. We have reason to regret, that this change is usually not of permanent continuance. Besides Plunket's remedy, various other preparations of arsenic have been externally employed.

Mr. Justamond's applications to cancer, originally suggested by a receipt, said to be preserved in the Earl of Arundel's family, were somewhat varied. They were generally combinations of arsenic and sulphur. The above receipt directs an ounce of yellow arsenic, with half that quantity of armenian bole, and sometimes as much red precipitate. Mr. Justamond also employed a sulphuret of arsenic, and a combination of this sulphuret with crude antimony. The arsenical preparation, preferred, was scraped and laid on the middle of the sore, while its edges were moistened with a combination of muriated iron, and sal ammoniac. The effects were, the correction of the fetid smell, melioration of the appearance of the sore, and separation of the cancerous part.

In the Pharmacopœia Chirurgica, Mr. Justamond's arsenical caustic is directed to be made in the following manner: ℞ antimonii pulverizati ℥ij. arsenici pulverizati ℥j. These are to be melted together in a crucible. The application may be reduced to any degree of mildness by the addition of powdered opium. The latter ingredient may also act specifically in diminishing the pain. M. Febure's remedy consisted of ten grains of arsenic, dissolved in a pint of water, with an ounce of the extract of cicuta, three ounces of Goulard's extract, and a dram of laudanum. With this fluid the cancer was washed every morning. He gave also arsenic internally, and directs two grains to be dissolved in a pint of water, to which must be added syrup of chicory, with half an ounce of rhubarb. A tablespoonful is to be given night and morning, with half a dram of the syrup of poppies. It may be remarked, that the dose of the arsenic in this preparation, is one twelfth of a grain.

The kali arsenicatum is an excellent preparation for internal exhibition, and is thus made:

℞ Arsenici Albi, Nitri Purificati, singulorum unciam:

Crucibulo amplo igne candenti injice nitrum, et liquefacto adde gradatim arsenicum in frustulis, donec vapores nitrosi oriri cessaverint. Solve materiam, in aquæ distillatæ libris quatuor, et post idoneam evaporationem sepone, ut fiant crystalli.

Dosis, Grani pars decima ter quotidie.

It may be given in the following way.

℞ Kali arsenicati gr. ij.
Aq. Menthæ Sativæ ℥iv.
Spirit. Vinosi tenuioris ℥j. M. et cola.
Dosis drachmæ duæ ter quotidie.

The following is Dr. Fowler's method of preparing arsenic for internal use. Take of powdered arsenic, and prepared kali, each sixty-four grains; boil them gently in a Florentine flask, or other glass vessel, with half a pound of distilled water, until the arsenic is dissolved. To this solution, when cold, add half an ounce of the compound spirit of lavender, and as much water as will make the whole equal to a pint, or fifteen ounces and a half in weight. The dose of this solution is as follows: From two years old to four, gutt. ij or iij to v; from five to seven, gutt. v to vij; from eight to twelve, gutt. vij to x; from thirteen to eighteen, gutt. x to xii; from eighteen upwards, gutt. xij.

These doses may be repeated once in eight or twelve hours, diluted with thick gruel or barley-water.

It will only be in my power to specify here a few of the numerous surgical cases, in which the internal employment of arsenic has been proposed. The following are particularly worthy of attention: tetanic affections; cancer; noli me tangere; elephantiasis; numerous unnamed malignant ulcers; several obstinate cutaneous diseases; pseudo-syphilis, and those sequelæ of the venereal disease, which cannot be subdued by mercury, &c.

Arsenic has also been recommended for the prevention of hydrophobia by Dr. J. Hunter. (See *Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol. I.*) Subsequent trials of this medicine, however, in such cases, do not seem to entitle it to much confidence. After the symptoms have begun, arsenic decidedly has no power in arresting the disease. It was lately tried by Dr. Marcet. Three drops of Fowler's solution were ordered to be taken, every other hour, in two drams of peppermint or water, with half a dram of syrup. However, no relief whatever seemed to be derived from the medicine. (See *Medico-Chirurgical Transactions, Vol. 1. p.* 141—156.)

But, although arsenic has hitherto failed in producing benefit in cases of hydrophobia, some facts have been recently published by Mr. Ireland, surgeon to the 4th battalion of the 60th Regiment, which make it appear a truly valuable and efficacious remedy for counteracting the poison of serpents. (See *Medico-Chirurgical Transactions, Vol. 2, p.* 393, *and the article, Wounds—Bite of the Viper, in this Dictionary.*)

Surgeons are frequently desired to examine the bodies of persons, suspected of having been poisoned with arsenic, and every practitioner should qualify himself to judge whether the suspicion is rightly formed, or not. Often, indeed, the life of the person, supposed to have administered the poison, will entirely depend upon the nature of the medical evidence. Besides, in certain cases, the symptoms, which precede a natural death, are of such a description, as to create strong suspicions that the patient has died of poison, when the fact is otherwise. Hence, it must be plain, that, both with respect to the question of murder, and of suicide, the evidence of the surgeon will frequently be of the utmost importance.

The symptoms and effects of arsenic, when taken into the stomach, ought to be well remembered. A pricking and burning sensation will soon be experienced in this organ. Sudden and excruciating pains will be felt in the bowels. A severe vomiting will arise. The tongue, mouth, and throat, will become rough, and parched, and an unquenchable thirst will prevail, with much anxiety and restlessness. When the dose of arsenic has been considerable, and proper antidotes have not been employed in time, an inflammation of the stomach and intestines will be the consequence, and it sometimes terminates in gangrene. Distention of the abdomen, coldness of the extremities, slow feeble pulse, fetid vomiting and stools, hiccough, and, lastly, death, ensue. In one instance of death from arsenic, related by Dr. Yelloly, not the least mark of pain, or tenderness, in the abdomen, was perceptible while the patient lived. (See *Edinb. Med. and Surgical Journal, Vol.* 5, *p.* 391.)

When the body of a person, who has been poisoned with arsenic, is opened, the small intestines are generally found inflamed and thickened, their external surface being in some places of a florid red colour, and in others, of a purple hue; while here and there effusions of coagulating lymph may be observed. The large intestines in general seem to suffer less, though, in some cases, they are found more or less inflamed as far as the extremity of the rectum. Sometimes, various portions of the intestinal tube are in a gangrenous state.

The villous coat of the stomach is considerably inflamed, and points of extravasated blood may commonly be noticed upon it. In one case, examined by Dr. Yelloly, there were observed two, or three circular spots, of the size of a shilling, which were abrasions of the membrane. In some places, the villous coat seemed to be thickened by an effusion of lymph.

The convolutions of the intestines will often be found connected together by adhesions. The lining of the œsophagus will also sometimes partake of the inflammation.

Violent and even fatal effects may likewise be produced by the absorption of arsenic from the skin into the circulation. (See *Med. and Physical Journal, Vol.* 5, *p.* 543.)

There are five methods of detecting the presence of arsenic. First, by precipitating this mineral from any fluid, in which it is dissolved, by an alkaline hydro-sulphuret. Secondly, by precipitating any solution of arsenic by the sulphate of copper. Thirdly, by reducing the oxide into the metallic state, by heating it with extraneous substances in a glass-tube. Fourthly, by observing the effect, which arsenic has, in whitening copper, when heated in contact with it. Fifthly, by perceiving the peculiar odour, which is exhaled, when arsenic is evaporated from a heated surface.

When some of the solution of sulphuret of potash (kali sulphuratum) is added to a solution of the white oxide of arsenic, a precipitate is instantly formed of a bright orange colour.

All surgeons, however, should be aware, that a very similar effect is produced by adding the solution of kali sulphuratum to a solution of tartarised antimony; but, the precipitate is not formed so readily as when arsenic is concerned.

The second means of ascertaining the presence of arsenic is by precipitating a mixed solution of the white oxide of this metal and potash, by adding some of the solution of the sulphate of copper, (Cuprum vitriolatum). The precipitate, formed by this process, is of a beautiful green colour, and is well known by the name of Scheele's green paint. In order to produce such precipitate in the best way, Dr. Bostock recommends that the proportions of the oxide of arsenic, potash, and sulphate of copper, be to each other, as one, three, and five. (*Edinb. Med. and Surgical Journal, Vol.* 5. *p.* 169.)

The third method of detecting arsenic consists in reducing the oxide into the metallic state, by mixing the suspected powder with a little charcoal, putting these substances into a glass tube, and exposing them for a full quarter of an hour to a red heat. One end of the tube should be hermetically closed, the other stopped with a plug of clay. The glass must also be every where well coated with clay and sand, be about a quarter of an inch in diameter, and eight inches in length. On the application of caloric, the oxygen of the arsenic unites with the carbon, and forms carbonic acid gas, leaving the arsenic on the inside of the glass tube reduced to the metallic state. This is reckoned the most decisive test of the presence of arsenic; but, it will not answer when the quantity of the latter mineral is less than a grain.

The quality, which arsenic has, of uniting with copper and forming a white compound, is the fourth means of detecting the presence of the first of these metals. For this purpose, put one grain of suspected powder, with half a grain of powdered charcoal, and two drops of oil, between two plates of polished copper, which are to be bound together with some wire, and exposed, for some time, to a red heat.

Dr. Bostock has explained, that, when a paste of charcoal and oil alone is put between plates of copper, and exposed to heat, a somewhat similar white appearance is produced on them, so that the communication of a white colour to copper by arsenic is not the most eligible criterion, particularly, when the quantity of the suspected substance is small.

The fifth mode of judging of the presence of arsenic is by the low, bluish, white, flame, alliaceous smell, and white smoke, which arise when that mineral is thrown on a red hot body. This experiment will only afford information, to be depended upon, when the quantity of arsenic is considerable, and it is unmixed with other substances.

Of all the foregoing modes, Dr. Bostock deems that, in which the green precipitate is produced with the sulphate of copper, the most convenient, delicate, and decisive.

Of late, a new test of arsenic has been suggested. The following is the account given of it by Dr. P. M. Roget: "Let the fluid, suspected to contain arsenic, be filtered: let the end of a glass rod, wetted with a solution of pure ammonia, be brought into contact with this fluid; and let a clean rod, similarly wetted with a solution of nitrate of silver, be brought into contact with the mixture. If the minutest quantity of arsenic be present, a precipitate of a bright yellow colour, inclining to orange, will appear at the point of contact, and will readily subside to the bottom of the vessel.—(Note. As this precipitate is soluble in ammonia, particular care should be taken to avoid adding it in excess; indeed, the quantity of either ammonia or nitrate of silver employed, can scarcely be too small for the purpose of detecting the presence of arsenic.)

"In examining the circumstances, attending the agency of this test, the following particulars were observed. On adding successively ammonia and nitrate of silver to distilled water, no precipitation takes place. Fowler's arsenical solution affords a precipitate of a yellow colour, similar in appearance to that produced by a solution of the white oxyd; but, a solution of arsenic acid gives a precipitate of a red brick colour. The fixed alkalies, when substituted for ammonia, likewise produce a yellow precipitate; but, the results are less distinct, since, in the circumstances, in which the experiment is made, they decompose the nitrate of silver, an effect which ammonia does not produce. We found, by comparative experiments, that the precipitates, thrown down by the same reagents, (namely, ammonia and nitrate of silver,) when either zinc, iron, copper, mercury, or lead was contained in the fluid, had an appearance totally different from that produced by arsenic; and that the latter could readily be detected by the same means, notwithstanding the presence of these metals. The salts of copper, or lead, when previously mixed with a solution containing arsenic, occasioned no difference in the results. With a solution of oxymuriate of mercury, ammonia alone will occasion a white precipitate; but, if arsenic be also present, on addition of nitrate of silver the precipitate immediately acquires a yellow colour. The efficacy of this compound test is not weakened, but, on the contrary, seems to be rather increased by the presence of sulphate of iron. Sulphate of zinc was not found to interfere with its operation, any otherwise than requiring a larger quantity of ammonia, in order to saturate the sulphuric acid; but, when this has been effected, and the whole of the zinc precipitated, the addition of nitrate of silver produces the same yellow tint as in the other experiments. There is, therefore, reason to presume, that no admixture of metallic, or other salts, will occasion ambiguity, or enable the arsenic to escape detection, when the above test is properly applied. (Dr. Roget observes, in a note, that in the Philosophical Magazine, for 1809, Mr. Hume has proposed boiling the suspected matter with a solution of carbonate of potash, and bringing into contact with it a stick of dry nitrate of silver; a method, somewhat analogous to that above described, but, much less convenient in its practical application.)

"Being curious to determine the limit of minuteness in the quantity of arsenic, discoverable by this test, we dissolved a grain of white arsenic in a known quantity of distilled water, and, by successive additions of water to determinate portions of this solution, prepared other solutions, containing respectively one 2000th, one 20,000th, and one 200,000th of their weight of arsenic. By applying the test to a small quantity in a watch-glass, we found, that, when it contained only one 25,000th of a grain of arsenic, the precipitate was of a bright yellow colour. It was still distinctly yellow, when the quantity of arsenic was reduced by dilution to one 50,000th of a grain. When further diluted, the yellowness was gradually less and less discernible, and the precipitate appeared of a light blue. It retained this colour, until its quantity became too minute for observation. A bluish cloud, however, was very distinctly visible, when the fluid examined contained only the 250,000th part of a grain of arsenic.

"If, (says Dr. Roget) along with the extraordinary degree of delicacy of this test, we take into consideration the extreme facility of applying it, and the greater convenience of operating upon fluids, than upon solid bodies, as we are obliged to do, when we have recourse to the usual methods, it appears decidedly entitled to preference." (See *Medico Chirurgical Transactions, Vol.* 2. *p.* 156—160.)

The following plan should be pursued, when arsenic has been swallowed in such a quantity as to endanger life. An emetic of white or blue vitriol should be exhibited immediately, and large quantities of water swallowed, in which the liver of sulphur (kali sulphuratum) is dissolved. The stomach having been thus emptied, a mixture, containing the kali sulphuratum, about a scruple to a dose, should be frequently exhibited, milk, butter, or castor oil, being freely given in the intervals.

The employment of copious blood-letting, in cases of poison from arsenic, was suggested by Dr. Yelloly, on the principle of removing inflammation. "Analogy (says he) seems to indicate its employment; but, its particular fitness can only be determined by experience." (*Edinburgh Medical and Surgical Journal, Vol. 5. p.* 393.) Dr. Roget has put this proposal to the test of experiment, and the recovery, which was effected by that gentleman, after a large quantity of arsenic had been swallowed, and most alarming symptoms had come on, seems to be much in confirmation of the utility of the practice. (See *Medico-Chirurgical Transactions, Vol.* 2, *p.* 136.)

This article would admit of being considerably lengthened; but, as some of the subject is as much medical as surgical, I think it will be sufficient in this work to refer the reader to sources, from which more extensive information may be obtained. (See *Observations on the different Methods recommended for detecting minute Portions of Arsenic, by John Bostock, M. D. Edinb. Med. and Surgical Journal, Vol.* 5. *p.* 166, *also p.* 14. *Dissertatio Inauguralis de Effectibus Arsenici in varios organismos necnon de indiciis quibusdam veneficii ab Arsenico illati; quam præside C. F. Kielmayer publice defendet, Jan.* 1808. *Auctor Georg. Fried. Jaeger, Stuttgardianus,* 8*vo. Tubrisgæ. in Nouvelles Experiences sur les Contre-poisons de l'Arsenic, par Casimir Renault, Paris an. IX. Murray's System of Chemistry, Vol.* 3, *p.* 356, *Edit.* 2. *Observations on the Use of Arsenic, by G. N. Hill, in Edinburgh Med. and Surgical Journal, Vol. 5, p.* 19—312. *Pharmacopœia Chirurgica. Medico-Chirurgical Transactions, Vol.* 1, *p.* 141, *Vol.* 2, *p.* 136, 156, *and* 393, *Vol.* 3, *p.* 342, *Vol.* 6, *p.* 663, *&c.*

**ARTERIOTOMY.** (from *αρτηρια*, an artery, and *τεμνω*, to cut.) The operation of opening an artery, for the purpose of taking away blood for the relief of diseases. (See *Bleeding.*)

**ARTERIES,** *Wounded.* (See *Hemorrhage.*)

**ARTICULATIONS,** *Diseases of.* (See *Joints.*)

**ASTRINGENTS.** (from *astringo*, to bind.) In medicine, are those substances which possess a power of making the living fibres become contracted, condensed, and corrugated. They are employed in the practice of surgery chiefly as external applications, either for restoring diminished tonic power, or checking various discharges. They are also deemed very eligible local remedies for phlegmonous inflammation.

**ATHEROMA.** (from *αθηρα*, pap.) An encysted tumour, so named from its pap-like contents. (See *Tumours Encysted.*)

**AXILLARY ARTERY,** *Wounded.*—When, in a case of this description, it is necessary to tie the injured vessel, Scarpa believes, that nothing tends more to embarrass the surgeon, than an injudicious smallness of the first incision through the skin and such other parts as conceal the wound in the artery. An assistant must compress the vessel, from above the clavicle, as it passes over the first rib. When the weapon has penetrated, from below upward, directly into the axilla, the surgeon is to make a free dilatation of the wound upon a director, or his finger. This must be done to a sufficient height to expose a considerable portion of the artery, and the precise situation of the wound in it.

When the weapon has pierced obliquely, or from above downwards, through a portion of the great pectoral muscle, into the axilla, Scarpa advises the surgeon to cut through the lower edge of this muscle, and enlarge the wound, on a director, or his finger, so as to bring fairly into view the injured part of the artery. The thoracic arteries, divided in this operation, must be immediately tied. The clots of blood are then to be removed, and the bottom of the wound cleaned with a sponge, by which means the opening in the axillary artery will be more clearly seen. As this vessel lies imbedded in the brachial plexus of nerves, the surgeon must take care to raise it from these latter parts with a pair of forceps, before he ties it. Two ligatures will be required; one, above; the other, below the wound of the artery.

# B.

**BALSAMUM COPAIVÆ.** Exhibited by surgeons principally in cases of gonorrhea, gleet, and piles. A dram may be given thrice a day.

**BALSAMUM PERUVIANUM CUM FELLE BOVINO.** ℞ Fellis Bovini ʒiij Balsami Peruv. ʒj. M. Dr. H. Smith has advised this application to be occasionally dropped into the ear, when there is a fetid discharge from it. The meatus auditorius externus is also to be washed out every day, by syringing the passage with water, to which some recommend soap to be added.

**BANDAGE.** (*Deligatio. Fascia.*) An apparatus, consisting of one or several pieces of linen, or flannel, and intended for covering, or surrounding parts of the body for surgical purposes.

The use of bandages is to keep dressings, compresses, remedies, &c. in their proper situation; to compress blood-vessels, so as to restrain hemorrhage; to rectify certain deformities by holding the deranged parts in a natural position; and to unite parts, in which there is a solution of continuity. As the application of bandages is an important branch of surgery, authors have not neglected it. Much has been written on the subject, and almost every writer has devised new bandages, perhaps without much benefit to surgery. Unfortunately, it is next to impossible to give very clear ideas of the numerous sorts of bandages by description. The surgeon can only acquire all the necessary instruction and information from the experience and habit resulting from practice. Hence, we shall confine ourselves to a general account of the subject.

Bandages should be made of such materials as possess sufficient strength to fulfil the end proposed in applying them, and they should, at the same time, be supple enough to become accommodated to the parts to which they are applied.

Bandages are made of linen, cotton, or flannel. If possible, they should be without a seam, and linen is woven for this purpose; but the selvage is always harsh, and, as the edges are necessarily covered by the next round, they are sometimes inconvenient. Most surgeons prefer, therefore, old linen, and more readily submit to the inconvenience of the edges unravelling, than to the irregularity which any stitching would produce.

There are cases, in which the bandage should have a degree of firmness, that does not belong to the materials usually made use of. This circumstance is obvious in cases of hernia, and in all those in which there is occasion for elastic bandages. As we have already observed, linen, flannel, and cotton (calico), are the common materials. The first employment of flannel bandages is imputed to the Scotch surgeons, who preferred them to linen ones, in consequence of their being better calculated for absorbing moisture, while, being more elastic, they yield in a greater degree in cases requiring this property; as in the swelling subsequent to dislocations, fractures, &c. It has been asserted, that linen is better than flannel, because more cleanly; but neither one nor the other will continue clean, unless care be taken to change it often enough.

The employment of cotton or calico bandages is a more recent method, and many advantages are attributed to the softness and elasticity of this material.

In applying a bandage, care must be taken, that it be put on tight enough to fulfil the object in view, without running any risk of stopping the circulation, or doing harm in any other way. If it be not sufficiently tight to support the parts in a proper manner, it is useless; if it be too tense, it will produce swelling, inflammation, and even mortification.

To apply a roller skilfully, the part which it is to cover, must be put in its proper situation; the head of the roller held in the surgeon's hand, and only so much unrolled as is requisite for covering the part.

In general the bandage should, if possible, be applied in such a manner as will admit of its being removed with the most ease, and allow the state of the parts beneath to be examined, as often as occasion requires.

For this reason, in fractures of the leg and thigh, the eighteen-tailed bandage is generally preferred to a simple roller. The former may be loosened and tightened, at pleasure, without occasioning the smallest disturbance of the affected limb; a thing which could not be done, were a common roller to be employed.

As soon as a bandage has fulfilled the object for which it is applied, and it has become useless, its employment should be discontinued; for, by remaining too long on parts, it may obstruct the circulation, diminish the tone of the compressed fibres, and vessels, and thus do harm.

Bandages are either *simple* or *compound.* They are also sometimes divided into *general* and *particular.* The latter often derive their names from the parts, to which they are usually applied.

A simple bandage is a long piece of

linen or cotton, of an indefinite length, and from three to six inches in breadth. When about to be applied, it is commonly rolled up, and the rolled part is termed its *head.* When rolled up from each end, it is called a *double-headed roller* or *bandage.*

The chief of the simple bandages are the *circular,* the *spiral,* the *uniting,* the *retaining,* the *expellent,* and the *creeping.*

The *circular* bandage is the simplest; the rolls cover each other, and it is seldom long, as two or three turns are generally enough.

The *spiral* bandage is the most frequently used of all; for, it is this which we see in such common employment on the limbs, in cases of ulcers, &c. In applying a common roller to the whole of a limb, the bandage must be carried round the part spirally, or else it is obvious that the whole member could never be covered. When the leg is the part, the surgeon is to begin by surrounding the foot with a few turns. Then carrying the head of the bandage over the instep, he is to convey it backward, so as to make the bandage unroll, and apply itself just above the heel. The roller may next be brought over the inner ankle; thence again over the instep, and under the sole; and the surgeon then brings the bandage spirally upward once more to the outer part of the leg. After this, every circle of the roller is to be applied, so as to ascend up the limb in a gradual, spiral form, and so as to cover about one third of the turn of the roller immediately below. The increasing and diminishing diameter of the limb, is one great cause, which brings into view the unskilfulness of a surgeon in this common operation; for, it prevents the roller from lying smoothly, although spirally applied, unless a particular artifice be dexterously adopted. The plan alluded to, is to double back the part of the roller that would not be even, were the application to be continued in the common spiral way, without this manœuvre. When the bulk of the limb increases very suddenly, it is sometimes necessary to fold, or, as it is termed, *reverse,* every circle of the bandage in the above manner, in order to make it lie evenly on the limb. It is manifest, that the pressure of the roller will be greatest where the duplicatures are situated, and hence, when it is an object to compress any particular part, the surgeon should contrive to reverse the turns of the bandage just over the situation where most pressure is desirable.

When a roller is to be applied to the forearm, it is best to make the few first turns of the bandage round the hand.

Care must be taken not to make the bandage very tight, if it be intended to wet it afterwards with any lotion; for, it is always rendered still more tense by moisture.

Mr. John Bell describes the principal purposes for which a roller is employed, as follows: "Although in recent wounds, it is with plasters and sutures that we unite the parts point to point, yet it is with the bandage that we support the limb, preserve the parts in continual and perfect contact with each other, and prevent any strain upon the sutures, with which the parts are immediately joined, and we often unite parts by the bandage alone. (This is called the *Uniting Bandage,* and will be presently described.) But it is particularly to be observed, that in gun-shot wounds, and other bruised wounds, though it would be imprudent to sew the parts, since it is impossible that they should altogether unite, yet the gentle and general support which we give by a compress and bandage, prevents them from separating far from each other, unites the deep parts early, and lessens the extent of that surface, which must naturally fall into suppuration.

"In the hemorrhagy of wounds, we cannot always find the artery; we dare not always cut parts for fear of greater dangers; we are often alarmed with bleedings from uncertain vessels, &c. or from veins as well as arteries: these hemorrhages are to be suppressed by the compress; which compress, or even the sponge itself, is but an instrument of compression, serving to give the bandage its perfect effect. Frequently, in bleedings near the groin, or the arm-pit, or the angle of the jaw, wherever the bleeding is rapid, the vessels uncertain, the cavity deep, and the blood not to be commanded by a tourniquet, and where the circumstances forbid a deliberate and sure operation, we trust to compress and bandage alone.

"Bandage is very powerful in suppressing bleeding. At one period of surgery, it took place of every other method, &c. If a compress be neatly put upon the bleeding arteries, if there be a bone to resist the compress, or even if the soft parts be firm below, and the bandage be well rolled, the patient is almost secure. But such a roller must be rolled smoothly from the very extremity of the fingers or toes; the member must be thoroughly supported in all its lower parts, that it may bear the pressure above. It is partial stricture alone that does harm, creates intolerable pain and anxiety, or brings on gangrene. Hemorrhagy requires a very powerful compression, which must therefore be very general, &c. It must not be made only over the bleeding arteries, which is all that the surgeon thinks of in general, &c.

"In abscesses, where matter is working downwards along the limb, seeking out, as it were, the weak parts, undermining the skin, and wasting it, insulating and surrounding the muscles, and penetrating to the bones, the bandage does every thing. The expelling bandage, the propelling bandage, the defensive bandage, were among the names, which the older surgeons gave to the roller, when it was applied for these particular purposes; and these are properties of the roller, which should not be forgotten." (*Principles of Surgery, Vol.* 1.)

Soon after this description of some of the chief surgical uses of the roller, Mr. John Bell proceeds to explain, in what manner this most simple of all bandages may be put on a limb.

"Practice will convince you, that the firmness and neatness of a bandage depend altogether upon these two points; first, upon the turns succeeding each other in a regular proportion; and, secondly, upon making reverses, wherever you find any slackness likely to arise from the varying form of the limb. Thus, in rolling from the foot to the ankle, leg, and knee, you must take care, first, that the turns, or, as the French call them, *doloires*, of the roller lie over one another by just one third of the breadth of the bandage; and, secondly, that at every difficult part, as over a joint, you turn the roller in your hand, make an angle, and lay the roller upon the limb, with the opposite flat side towards it; you must turn the bandage so as to reverse it, making, what the French call, a *renversée* of the roller at the ankle, at the calf of the leg, and at the knee. You must be careful to roll your bandage from below upwards, and support the whole limb by a general pressure. That you may be able to support the diseased part with a particular pressure, you must lay compresses upon the hollows and upon the bed of each particular abscess, and change the place of these compresses from time to time, so as now to prevent matter sinking into a particular hollow, now to press it out from a place where it is already lodged, and again to reunite the surface of an abscess already completely formed, from which the matter has been discharged." (*Principles of Surgery, Vol.* 1.)

In the article *Joints*, we have taken notice of the good effects of the pressure of a roller in the cure of white-swellings. Here we shall just introduce Mr. John Bell's sentiments upon the subject: "In a diseased bursa, as in a relaxation of the knee-joint, that disease, which, with but a little indulgence, a very little encouragement of fomentations, poultices, bleeding, and low diet, would end in white-swelling of the knee; may be stopped even by so simple a matter as a well-rolled bandage." (*Vol.* 1, *p.* 127.)

The *uniting bandage*, or *spica descendens*, used in rectilinear wounds, consists of a double-headed roller, with a longitudinal slit in the middle, of three or four inches long. The roller, having one head passed through the slit, enables the surgeon to draw the lips of the wound together. The whole must be managed, so that the bandage may act equally. When the wounds are stitched, this bandage supports the stitches, and prevents their tearing through the skin. When the wound is deep, writers advise a compress to be applied on each side, in order to press the deeper part of its sides together. When the wound is very long, two or three bandages should be employed, and great care must be taken, that the pressure is perfectly equable.

Henkel and Richter recommend a uniting bandage, which allows the surgeon to see the wound, over which only narrow tapes cross. The reader, if he should ever wish to employ this contrivance, may read a description of it in Rees's Cyclopædia, or Motherby's Medical Dictionary; though I confess I could not understand it from the description in those works, until I looked at the plate in Richter's Anfangsgr. der Wundarzn. Band 1.

When we make use of a single-headed roller, as a *retentive bandage* only, we should always remember to begin the application of it on the side opposite the wound. The obvious reason for so doing is to prevent a farther separation of the lips of the wound, as the contrary manner of applying the roller would tend directly to divide them. (*Gooch, Vol.* 1, *p.* 143.)

The intention of the *expellent bandage* is to keep the discharge sufficiently near the orifice of the wound to prevent the formation of sinuses. In general, a compress of unequal thickness is necessary; the thinner part of the compress being placed next, and immediately contiguous to, the orifice of the wound; the thicker part below. Before the bandage is applied, the pus must be completely pressed out, and the rolling begin with two, or three, circular turns on the lower part of the compress. The bandage must then be carried spirally upwards, but not quite so tightly, as below. It is afterwards to be rolled downward to the place, where it began.

The *creeping* is a simple bandage, every succeeding turn of which only just covers the edge of the preceding one. It is employed in cases, in which the object is merely to secure the dressings, and not to make any considerable, or equable pressure.

A bandage is termed *compound*, when

several pieces of linen, cotton, or flannel, are sewed together in different directions, or when the bandage is torn or cut, so as to have several tails. Such are the T bandage, the suspensory one, the capistrum, &c.

The *eighteen-tailed bandage* is one of the most compound. It is now in general use for all fractures of the leg and thigh, sometimes for those of the forearm, and, frequently, for particular wounds. Its great recommendations are the facility with which it can be undone, so as to allow the parts to be examined, and its not creating, on such an occasion, the smallest disturbance of the disease, or accident.

The eighteen-tailed bandage is made by a longitudinal portion of a common roller, and by a sufficient number of transverse pieces, or tails, to cover as much of the part as is requisite.

Each of the cross pieces is to be proportioned in length to the circumference of the part of the limb, to which it is to be applied; so that in making this sort of bandage for the leg, or thigh, the upper tails will be twice as long as the lower ones. After laying the long part of the bandage on a table, fix the upper end of it in some way, or another. Then begin laying the upper tails across it, and proceed with placing the rest. Each tail must be long enough to extend about two inches beyond the opposite one, when they are both applied. The tails, being all arranged across the longitudinal band, they are to be stitched in this position with a needle and thread. When the bandage is intended for the leg, a piece of the longitudinal part of the roller below, is to extend beyond the tails. This is usually brought under the sole of the foot, and then applied over the inner ankle in the first instance, after the bandage has been put under the limb. Then the surgeon lays down the first of the lower tails, and covers it with the next one above. In this way, he proceeds upward, till all the cross pieces are applied, the uppermost one of which he fastens with a pin. This bandage has a very neat appearance. The tails are said to lie better, when placed across the longitudinal piece a little obliquely. (*Pott.*)

The *T bandage* is, for the most part, used for covering parts of the abdomen and back, and especially, the scrotum, perinæum, and parts about the anus. Its name is derived from its resemblance to the letter T, and it is, as Mr. John Bell remarks, the peculiar bandage of the body. If the breast, or belly, be wounded, we make the transverse piece, which encircles the body, very broad, and having split the tail-part into two portions, one of these is to be conveyed over each side of the neck, and pinned to the opposite part of the circular bandage, so as to form a suspensory for the latter, and prevent its slipping down. But, says Mr. John Bell, if we have a wound, or disease, or operation, near the groin, or private parts, the tail-part then becomes the most important part of the bandage: then the transverse piece, which is to encircle the pelvis, is smaller, while the tail-part is made very broad. When the disease is in the private parts, perinæum, or anus, we often split the tail according to circumstances; but, when the disease is in one groin, we generally leave the tail-part of the bandage entire and broad.

The *linteum scissum,* or *split-cloth,* is a bandage applied occasionally to the head, and consists of a central part, and six, or eight tails, or heads, which are applied, as follows:

When the cloth has six heads, the middle, or unsplit part of the cloth is applied to the top of the head. The two front tails go round the temples, and are pinned at the occiput; the two back tails go also round the temples, and are pinned over the forehead, the two middle tails are usually directed to be tied under the chin; but, as Mr. John Bell observes, this suffocates and heats the patient, and it is better to tie them over the top of the head, or obliquely, so as to make pressure upon any particular point. (*Principles of Surgery, Vol.* 1, *p.* 131.)

The old surgeons usually split this middle tail into two parts, a broad, and narrow one. In the broad one, they made a hole to let the ear pass through. This broad portion was tied under the chin, while the narrow ends were tied obliquely over the head. As Mr. John Bell has observed, though this gave the split-cloth the effect of eight tails, yet, the ancient surgeons did not name it the split-cloth with eight tails. When they split the cloth into eight tails, and, especially, when they tied the eight tails in the following particular manner, they called the bandage *cancer,* as resembling a crab in the number of its legs. The *cancer,* or *split-cloth of eight tails,* was laid over the head, in such a manner, that four tails hung over the forehead and eyes, while the other four hung over the back of the head. They were tied, as follows; first, the two outermost tails, on each side in front, were tied over the forehead, while the two middle tails in front were left hanging over the knot. Then the two outermost, or lateral tails behind were tied round the occiput. Next the middle tails were tied, the two anterior ones being made to cross over each other, and pass round the temples to be pinned at the occiput; while the two middle tails behind, were made to cross each other, and pass round the temples, so as to be pinned over the ears, or near the forehead. (See *John Bell's Principles, Vol. 1, p. 132.*)

The *triangular bandage* is generally a handkerchief doubled in that form. It is commonly used on the head, and, now and then, as a support to the testicles, when swelled. The French term it *couvre-chef en triangle.*

The *nodose bandage,* called also *scapha,* is a double-headed roller, made of a fillet four yards long, and about an inch and a half broad. It must be reversed two, or three times, so as to form a knot upon the part, which is to be compressed. It is employed, when a hemorrhage from a wound is to be stopped, or, for securing the compress, after bleeding in the temporal artery.

The most convenient bandage in general for the forehead, face, and jaws is the *four-tailed one,* or *single split-cloth.*

It is composed of a strip of cloth, about four inches wide, which is to be torn at each end, so as to leave only a convenient portion of the middle part entire. This unsplit middle portion is to be applied to the forehead, if the wound be there, and the two upper tails are carried backward, and tied over the back part of the head, while the two lower ones are to be tied either over the top of the head, or under the chin, as may seem most convenient.

When the wound is on the top of the head, the middle of the undivided part is to be applied to the dressings. The two posterior tails are to be tied forward, and the two anterior ones are to be carried backward, so as to be tied behind the head. This is sometimes called *Galen's bandage.* It is curious, that writers on bandages should use the terms *head,* and *tail,* synonymously, and hence this *four-tailed bandage* is often called the *sling* with *four heads.* Such confusion of language is highly reprehensible, as it contributes, in a very great degree, to obstruct the comprehension of any, the most simple subject.

If the upper lip be cut, and a bandage needed, which is seldom the case, it is almost superfluous to say, that this bandage will serve the purpose. It serves also in cuts of the lower lip, though there, also, we trust rather to the twisted suture, than a bandage.

The single split-cloth is particularly useful in supporting a fractured lower jaw, and, in such cases, is the only one employed in modern surgery. This bandage, when used for this particular purpose, namely, supporting the lower jaw, is named *capistrum,* or *bridle,* because it goes round the part somewhat like a horse's halter.

"In some cases, (says Mr. John Bell) the circumstances require us to support the chin particularly, and then the unslit part of the bandage is applied upon the chin with a small hole to receive the point; but, where the jaw is broken, we pad up the jaw-bone into its right shape, with compresses pressed in under the jaw, and secured by this bandage. When we are in fear of hemorrhagy after any wound, or operation, near the angle of the jaw, we can give the sling a very remarkable degree of firmness. For this purpose, we tear the band into three tails on each side, and we stitch the bandage at the bottom of each split, lest it should give way, when drawn firm, &c." (*Principles of Surgery, Vol.* 1.)

We have already described one way of applying a handkerchief, as a bandage to the head, when we noticed the *triangular one,* or *couvre-chef en triangle.* The other manner of applying the handkerchief, called the *grand couvre-chef,* is as follows:

You take a large handkerchief, and fold it, not in a triangular, but a square form. You let one edge project about three finger-breadths beyond the other, in order to form a general border for the bandage. You lay the handkerchief upon the head, so as to make the lower fold, to which the projecting border belongs, lie next the head; while the projecting border itself is left hanging over the eyes, till the bandage is adjusted. The two corners of the outermost fold are first to be tied under the chin; the projecting border is then to be turned back, and pinned in a circular form round the face, while the corners of the fold next the head are to be carried backward, and tied.

After the outer corners of this bandage have been tied under the chin; after the inner corners have been drawn out and carried round the occiput; and after the border has been turned back and pinned; the doubling of the handkerchief over each side of the neck hangs in a loose awkward manner. It remains, therefore, to pin this part of the handkerchief up above the ear, as neatly as can be contrived. (See *J. Bell's Principles.*)

The grand couvre-chef has certainly nothing to recommend it, either in point of utility, or elegance. A common night-cap must always be infinitely preferable to it. In the event, however, of a cap not being at hand, it is proper that the surgeon should know, what contrivances may be substituted to fulfil the objects in view.

Having, in the numerous articles of this Dictionary, noticed the mode of applying bandages in particular cases, and allotted a few separate descriptions for such bandages, as are not here mentioned, but, which are often spoken of in books, we shall conclude for the present, with referring the reader for further information to *Motherby's Medical Dictionary; Rees's Cyclopædia; and John Bell's Principles of Surgery, Vol. I. Galen and Vidus Vidius are reckoned the best of the old writers on the subject; M. Sue, Thillaye, Heister, Juville, Lombard, and Bernstein, of the modern ones. The latter are said, however, to be all too prolix.* (See *Rees's Cyclopædia, art. Bandage.*)

**BARK,** *Peruvian.* (See *Cinchona.*)

**BELLADONNA.** *Deadly Night-shade.* Is violently narcotic. The leaves were first used externally for discussing scirrhous swelling, and they have been subsequently given internally, in scirrhous and cancerous diseases, amaurosis, &c. Five grains are reckoned a powerful dose: one is accounted enough to begin with. At present, the extract, as directed by the London College, is more commonly prescribed.

From the power, which belladonna is known to possess, of lowering the action of the whole arterial system, it seems to be a fit medicine in many surgical cases, where that object is desirable, particularly in examples of aneurism.

A very peculiar virtue, which belladonna has, is that of causing a dilatation of the pupil, when used as an external application to the eye-brow and eye-lids. The late Mr. Saunders was in the habit of employing belladonna a good deal for this express purpose. A little while before undertaking the operation for the congenital cataract, he was accustomed to introduce some dissolved extract of belladonna between the eye-lids, or rub the eye-brow and skin about the eye freely with the same application. The consequence was, that, if there were no adhesions of the iris to other parts, a full dilatation of the pupil was produced in less than an hour, and the whole of the cataract was distinctly brought into view. This was unquestionably a considerable improvement, in practice, as the iris was kept out of danger, and the operation materially facilitated. I allude here more particularly to Mr. Saunders's own method, in which he introduced the needle through the cornea, in front of the iris, and then conveyed it to the cataract through the enlarged pupil. Belladonna was also externally applied by Mr. Saunders, after the operation, with a view of preventing the edge of the iris from becoming adherent to the edges of the torn capsule.

**BINOCULUS.** (from *binus*, double, and *oculus*, the eye.) A bandage for keeping dressings on both eyes. Its application will easily be understood by referring to *Monoculus.*

**BISTOURY.** (*Bistoire*, French.) Any small knife for surgical purposes.

**BLADDER,** *Puncture of.* This is an operation, to which we are obliged to have recourse, after having in vain employed all the other means indicated for preventing the bad, and even fatal consequences of a stoppage of the evacuation of the urine, and distention of the bladder. Various accidents, and diseases, both acute and chronic, may occasion this dangerous state, as we shall more particularly notice in the article, *Urine, Retention of.*

The bladder, which can conveniently hold about a pint and a half of urine, is no sooner dilated, so as to contain two pints, than uneasy sensations are experienced. The desire of discharging the water now becomes urgent, and if the inclination be not gratified, and the bladder be suffered to be dilated beyond its natural state, it loses all power of contraction, and becomes paralytic. The desire, indeed, continues, and the efforts are renewed in painful paroxysms; but, the power is lost, and the bladder becomes more and more distended. When this viscus is dilated in the utmost degree, and neither its own structure, nor the space in the abdomen can allow a further distention; either the bladder must be lacerated, which it never is, so equally is it supported by the pressure of the surrounding parts; or its orifice must expand and the urine begin to flow. After the third day of the retention, the urine often really begins to flow, and, whatever descends from the kidnies is evacuated in small quantities from time to time, and at this period, the bladder is distended in as great a degree, as it ever can be; however long the patient may survive. This dribbling of the urine, which begins, when the bladder is dilated to the utmost, and continues till the eighth, or tenth day, or till the bladder sloughs, has long been understood, and is named by the French, "*urine par régorgement.*" To practitioners, who do not understand it, the occurrence is a most deceitful one. The friends felicitate themselves, that the urine begins to flow; the surgeon believes it, basins and cloths, wet with urine, are easily produced; but, the patient lies unrelieved. The continued distention of the bladder is followed by universal inflammation of the abdomen. The insensibility, and low delirium of incipient gangrene, are mistaken for that relief, which was expected from the flow of urine, till either hiccough comes on, and the patient dies of fever, and inflammation, or the urine gets through an aperture, formed by mortification, into the abdomen. Let no surgeon, therefore, trust to the reports of nurses and friends, but lay his hand upon the hypogastric region, and tap with his finger, that he may distinguish the distended bladder, and the fluctuation of urine. As the bladder suffers no further distention, after the third day, why should it burst? Not from laceration; for, it is supported by the uniform pressure of the surrounding viscera; not by yielding suddenly, for it is distended to its utmost on the third day of the retention, and yet seldom gives way before the tenth; not by attenuation, for it becomes thickened. The term *laceration* was never more wrongly applied, than in this instance; for, when there is a breach in the bladder, it is found, on dissection, to be a small round hole, such as might be covered with the point of the finger. The rest of the viscus, and the adjacent bowels, are red and inflamed, while this single point is black, and mortified! Delay is more dangerous, than even the worst modes of making an opening into the bladder, and, while life exists, the patient should have his chance. —(See *John Bell's Principles of Surgery, Vol.* 2, *Part* 1, *p.* 262, *&c.*)

That many patients die after the paracentesis of the bladder is an undoubted truth, and this circumstance has rather intimidated practitioners against the operation. It appears to me, however, that death may in general be more fairly ascribed to the effects of the disease, than to the puncture of the bladder, and that, if this last measure were not deferred so long, as it often is, the recoveries would be more numerous.

Hence, when relief cannot be obtained by the treatment described in the article, *Urine, Retention of;* when no urine has come away, before the end of the third day; when it only does so in a dribbling manner after this period, while the bladder continues distended, and no catheter can be introduced; the operation should not be delayed. In urgent cases, one should rather operate, as soon as forty-eight hours have elapsed.

No doubt, a man, who is exceedingly skilful in the use of the catheter, and knows how to practise with science and judgment all the other means for relieving the retention of urine, will not frequently find it necessary to have recourse to the operation of puncturing the bladder. This is said to have been so much the case with the eminent Desault, that, in the course of ten years, he had occasion only once to perform such an operation in the Hôtel Dieu, where diseases of the urethra are always extremely numerous. (See *Œuvres Chir. de Desault par Bichat, Tom.* 2, *p.* 316.) When, however, this superior manual dexterity with the catheter is not the acquirement of the practitioner, the timely performance of the paracentesis of the bladder should ever be observed. I shall next treat of the three modes of doing the operation.

### 1. *Puncture through the Perinæum.*

The first surgeon that ever performed this operation is said to have been M. Tolet, a French surgeon, well known for a valuable treatise, entitled, "*Traité de Lithotomie, ou de l'extraction de la pierre hors de la vessie, Troisieme édition, Paris* 1681." According to Sabatier, it was customary, at the time of Dionis, to make the opening with a narrow pointed scalpel, about four or five inches long, which was plunged into the bladder, at the place where the incision in the apparatus major terminated. (See *Lithotomy.*) The escape of the urine indicated when the surgeon had reached the bladder. A straight probe was then conducted along the knife, and, then a cannula was passed along the probe into the bladder, where it was allowed to remain as long as necessary, care being taken to fix it by means of tapes, passed through the rings at the broad part of the instrument; and to stop up the opening with a linen tent. Some practitioners, however, began with cutting the perineum, after introducing a staff as far into the urethra as possible. Having made an opening into this canal, they conveyed a gorget along the staff into the bladder, and a cannula was next passed into the same viscus along the gorget, and allowed to continue there. This mode of proceeding, which Sabatier terms more methodical, than that which has been first mentioned, could only answer in cases, where the obstruction about the neck of the bladder was inconsiderable, and where in fact the introduction of the catheter was not yet impracticable. At least, therefore, the method was unnecessary. The other plan of piercing the urethra in several places, and making a passage for the urine through the prostate, says Sabatier, increased the inflammation, with which this gland was affected, and rendered the disease, if not mortal, at least much more difficult of cure.

Sabatier represents Dionis, as the first who suggested the method of opening the bladder on one side of the perineum, at the part, where Frère Jacques used to perform lithotomy. Dionis conceived, that by operating in this way, the patient would suffer less pain, because neither the urethra, nor the neck of the bladder, would be injured; but at the same time, he has recommended a process, to be followed, which was similar to that pursued in making the puncture in the middle of the perineum; viz. that a narrow scalpel should first be introduced, so as to make a passage for the probe, along which the cannula is to pass into the bladder. The idea of substituting for these unsuitable instruments a trocar of convenient length was exceedingly simple, and, for this improvement, which took place in 1721, surgery is indebted to Juncker, (See *Conspectus Chirurgiæ, Tab.* 97, *p.* 674), unless the following passage be correct: "In the year 1717, or 1718, M. Peyronie shewed in the King's garden a long trocar, which he had successfully employed in a similar puncture." (*Desault's Parisian Chirurgical Jonrnal, Vol.* 2, *p.* 267.)

The patient having been placed in the same position as for lithotomy, an assistant is to press with his left hand on the region of the bladder, above the pubes, in order to propel that viscus as far downward into the lesser pelvis as possible, while, with his right hand, he supports the scrotum. The surgeon is then to introduce the trocar at the middle of a line, drawn from the tuberosity of the ischium to the raphe of the perineum, two lines more forward than the verge of the anus. The instrument is first to be pushed in a direction parallel to the axis of the body; and its point is afterwards to be turned a little inwards. Here, according to Bichat, there is no occasion to convey the cannula so far into the bladder, as is done, when the operation is performed above the pubes. The portion of this viscus, that is pierced, being incapable of changing its position, with regard to other parts in the perineum, if the cannula only project a few lines into its cavity, it will not be liable to slip out. It would be wrong, indeed, to carry it in further; for, the pressure of its end against the posterior parietes of the bladder would do harm. Lastly, the cannula is to be fixed in its place, by means of the T bandage. (See *Œuvres Chirurgicales de Desault, Tom.* 3, *p.* 320.)

Some writers recommend the introduction of the left index finger into the rectum, in order to draw this intestine out of the way; but Sabatier thinks it better to use this finger for pressing on the part of the perineum, where the puncture is about to be made, so as to make the skin tense, and assist in the guidance of the trocar. (*Médecine Opératoire, Tom.* 2, *p.* 126.)

The parts, divided in this puncture, are the skin, a good deal of fat, and cellular substance, the levator ani muscle, and that portion of the lower part of the bladder, which is situated on one side of its neck.

The following is the judgment which Bichat has passed upon this method: There is in the track, which the trocar describes, no part, of which the puncture must of necessity give rise to bad symptoms. A surgeon, moderately exercised in the practice of this operation, is almost always sure of piercing the bladder. This viscus is opened in the most depending situation, at a part, which constantly bears the same relation to the perinæum. But, the position, in which the patient is placed for the operation, is a great deal more disagreeable, than that for the puncture above the pubes. Several assistants are required to fix him, and one is necessary for compressing the bladder in the hypogastric region. There is a possibility of wounding the vessels of the perineum, and of pricking the nerves, which accompany them. If the point of the trocar is carried too much outwards, it may glide on the external side of the bladder. If it is inclined forwards, it may slip between this viscus and the pubes. If it is turned too much inwards, it may pierce the prostate gland. If directed too much backwards, it may wound the vasa deferentia, the rectum, the extremity of the ureter, and the vesiculæ seminales. While the cannula is kept introduced, also, the patient can neither walk about, nor sit down; but, must continually keep himself in bed. Lastly, this mode of operating is frequently counter-indicated, by tumors, or other common diseases, at this part of the body, in consequence of retentions of urine. (*Œuvres Chirurgicales de Desault par Bichat, Tom.* 3, *p.* 321.)

The puncture of the bladder from the perineum is now almost universally abandoned by British surgeons. "We may esteem it fortunate," says Desault, "if the trocar penetrates directly into the bladder, after piercing the fat and the muscles, situated between the tuberosity of the ischium and the anus; and, as this viscus is subject to much variation in its form, the surgeon will be often defeated, unless he is perfectly clear in his ideas, respecting its situation and figure. This disappointment is not without example, and there is sufficient cause to deter a practitioner from performing this operation, independently of the danger of wounding with the trocar the vasa deferentia, vesiculæ seminales, ureter," &c. (*Parisian Chirurgical Journal, Vol.* 2, *p.* 267.)

If there are now any practitioners, who may be averse to the total relinquishment of this method, I think the following caution, given by Sabatier, may be of service to them: perhaps, the operation would be more safe, if the surgeon were to begin with making a deep incision in the perineum, as is practised in the lateral way of cutting for the stone, and if he were to desist from plunging the trocar into the bladder, until he had assured himself of the situation of this viscus, and felt the fluctuation of the urine. Garengeot has given this advice to Foubert, in regard to the mode of cutting for the stone practised by the latter, and it seems equally applicable in the present place. (*Médecine Opératoire, Tom.* 2, *p.* 127.)

### 2. *Puncture above the Pubes.*

The invention of the method of tapping the bladder from above the pubes was suggested by the practicableness of extracting calculi from that viscus, by what is usually denominated the high operation. The first performers of the puncture above the pubes are said to have employed a straight trocar, the very same instrument as was used for tapping the abdomen in cases of dropsy. The consequence was, that when such a trocar was too long, its cannula was apt to hurt the opposite parietes of the bladder, so as to occasion inflammation and a slough, on the separation of which the urine was liable to insinuate itself either into the abdomen, or rectum, as happened in a case mentioned by Mr. Sharp, where no more urine was discharged through the cannula, and the patient died of a sort of diarrhœa. When the trocar is short, the bladder on subsiding and contracting itself, gradually quits the cannula, which becomes useless, and a necessity for making another puncture is produced. Whatever pains may be taken to direct the trocar obliquely downwards and backwards, so that the cannula may be, in some degree, parallel to the axis of the bladder, one, or the other of these accidents, cannot always be prevented.

Their prevention, however, may be effected by merely employing, instead of a straight trocar, a curved one, which will naturally take a suitable direction. This improvement was embraced by Frère Côme, the inventor of the lithotome caché, who also devised a curved trocar, for the paracentesis of the bladder, very superior to the instrument of the same shape previously in use.

To this way of operating, Mr. Sharp was partial, and Mr. Abernethy has more recently recommended it, under certain circumstances. The former celebrated surgeon remarks, that it is an operation of no difficulty to the surgeon, and of little pain to the patient, the violence done to the bladder being at a distance from the parts affected. It is equally applicable, whether the disorder be in the urethra, or prostate gland, and when there are strictures, the use of bougies may be continued, while the cannula remains in the bladder. (*Critical Enquiry, p.* 125, *edit.* 4.)

Some writers recommend making an incision, about two inches long, through the linea alba, a little way above the pubes, and then introducing a trocar into the bladder. Others deem this preliminary incision quite useless, asserting, that the operation may be performed with equal safety, and less pain to the patient, by puncturing at once the skin, the linea alba, and the bladder. When the trocar has been introduced, the stilette must be withdrawn, and the cannula kept in its position by a riband, passed through two little rings, with which it should be constructed, and fastened round the body.

The orifice of the cannula should be stopped up with a little plug, so as to keep the urine from dribbling away involuntarily, and taken out as often as occasion requires. (*Encyclopédie Méthodique; Part. Chirurg. Art. Paracentese de la Vessie.*)

The trocar should be introduced in a direction obliquely downward and backward; for as this corresponds with the axis of the bladder, the instrument is less likely to injure the opposite side of that organ.

Nearly all writers advise the puncture to be made an inch, or an inch and a half, above the pubes. The reasons for so doing are the following: "If the puncture be made close to the os pubis, the bladder in that part, often rising with an almost perpendicular slope, leaves a chasm between it and the abdominal muscles, or, to speak more strictly, a certain depth of membrana cellularis only, so that, if the trocar penetrate but a little way, it possibly may not enter into the bladder. If it penetrates considerably, it may pass through the bladder into the rectum, or, if not in the operation itself, some days afterwards, when by the course of the illness and confinement the patient is more wasted. For, the abdominal muscles, shrinking and falling in, occasion the extremity of the cannula to press against the lower part of the bladder, and, in a small time, to make a passage into the rectum." (*Sharp in Critical Enquiry, p.* 127.) Though the reasons here adduced seem at first as formidable, as they are numerous, does not the danger of injuring the peritoneum, form an objection to plunging in a trocar at the above distance from the pubes? Certain it is, peritonitis would be more apt to be induced by such practice, than by introducing the instrument immediately above the pubes. Richerand decidedly condemns the plan, principally because the higher the puncture is made, the more apt will the bladder be to quit the cannula, on the urine being discharged. (See *Nosographie Chirurgicale, Tom.* 3, *p.* 472, *edit.* 2.) In Desault's works, by Bichat, the puncture is also advised to be made immediately above the pubes. *Tom.* 3, *p.* 318. Some of Mr. Sharp's objections are done away, by taking care to pass the trocar into the bladder in the axis of this viscus, and employing one which is somewhat curved, as Hunter, Frère Côme, Sabatier, &c. have advised. Mr. Sharp confirms the danger of using too long a cannula, by mentioning an accident, which occurred in his own practice. Though he introduced the instrument more than an inch and a half above the os pubis, yet having pushed it full two inches and a half, below the surface of the skin, its extremity in six or seven days insinuated itself into the rectum. (*Critical Enquiry, p.* 127.) The instrument, says an excellent writer, should be more or less long, according to the embonpoint of the patient; but, the ordinary length should be about four inches and a half. The curvature should be uniform, and form the segment of a circle, about eight inches in diameter. (*Œuvres Chir. de Desault par Bichat, Tom.* 3, *p.* 317.)

A catheter left in the bladder, longer, than ten days, may possibly gather such an incrustation from the urine, as not only to render the extraction of it painful, but even impracticable. This should caution us, therefore, never to leave the cannula in the bladder quite a fortnight. If necessary to leave one so long, Mr. Sharp advises a second one to be introduced, made with an end, like that of a catheter. (*Critical Enquiry, p.* 129.)

Mr. Abernethy first made an incision, between the pyramidales muscles, passed his fingers along the upper part of the symphysis pubis, so as to touch the distended bladder, and introduced a common trocar, of the middle size, in a direction obliquely downwards. On withdrawing the stilette, he passed a middle-sized hollow elastic catheter, through the cannula, into the bladder. The cannula was withdrawn, and the catheter left in, till the urine passed through the urethra. After a week, as the instrument was stopped up with mucus, it was taken out, and a new one introduced. (*Surgical Observations*, 1804.) It might be objected to this plan of employing a hollow bougie, that, as it is smaller, than the wound, the urine is not kept from passing between the instrument, and parts, into which it is introduced, as well as through the tube itself. This happened in Mr. Abernethy's case, and, though no urine in this instance, got into the cellular membrane; yet, it would probably do so sometimes, because, it is not till after inflammation has taken place that the cavities of the cellular substance are closed with coagulating lymph. After a time, however, the cannula of the trocar might be withdrawn, and the hollow bougie employed, if preferred, though it seems difficult to discover a reason for chusing it.

The following is one of Sir E. Home's conclusions: (*Med. and Chir. Trans. Vol.* 2.) "When the puncture is made above the pubis, the cannula, which incloses the trocar, is not to be removed, till the surrounding parts have been consolidated by inflammation, so as to prevent the urine in its passage out from insinuating itself into the neighbouring parts; for wherever the urine lodges, mortification takes place. Any advantage, therefore, which may arise from a more flexible instrument remaining in the bladder, is more than counterbalanced by its not filling completely the aperture through the coats of the bladder, and allowing the urine to escape into the cellular membrane."

There is much truth in the following passage: The abdomen is inflamed; the preliminary incisions, which prepare for the introduction of the trocar, sometimes pass through several inches of fat, and cellular substance; the incisions must be wide in proportion to their depth; the cannula is no sooner lodged here, than it is displaced, in some degree, by the contraction of the bladder, which, when emptied, subsides under the pubis. The cannula stands so obliquely, that the urine never flows with ease, but, by running out upon the wound, and by being injected among the cellular substance, it causes the wound to inflame; the wound by its proximity to the inflamed peritonæum soon mortifies, and thus, notwithstanding the temporary relief, produced by the emptying of the bladder, the patient dies on the third or fourth day. (*John Bell's Principles of Surgery, Vol.* 2, *p.* 271.)

That this operation is infinitely better, than that of making the puncture in the perineum, is indisputable. There are even now some good surgeons, who seem to prefer it to the method of tapping the bladder from the rectum. In the Œuvres Chirurgicales de Desault, Tom. 3, p. 324, it has received the preference, and at p. 319 of the same book, a high encomium is bestowed on it, in the following terms. "This operation is easy. The little thickness of the parts, which are to be wounded, renders it quick and triflingly painful. The surgeon has occasion for no assistance. The patient is neither intimidated, nor fatigued with the posture in which he is put. It is almost impossible to miss the bladder, except it were exceedingly contracted. There is no risk of piercing the cavity of the abdomen. Anatomy proves, that here the bladder is in immediate contact with the recti muscles, and that when this viscus is distended with urine, it pushes the peritoneum upwards and backwards, under which membrane it enlarges, and thus makes the point of the trocar become more and more distant from the cavity of the abdomen. The patient may easily lie on his side, or abdomen, so as to discharge all the urine contained in the bladder. There are here no nerves, nor vessels, of which the injury can be dangerous. No difficulty is experienced in fixing the cannula, and the presence of this instrument does not hinder the patient from sitting, standing up, or even walking about in his chamber. When the cannula, also, is introduced to the lower part of the bladder, this viscus cannot possibly quit it. Lastly, the wound heals with more facility, than that made in any other method."

Respecting this advice to push the cannula so far into the bladder, it is highly objectionable, for the reason already explained. The writer of the preceding commendation seems to me rather too partial. He has told us of the little thickness of the wounded parts, and, yet a little before bestowing these praises, he has acknowledged, "*il est rare, que dans cette ponction, on traverse directement la ligne blanche: on passe presque toujours sur ses côtés, et l'on divise la peau, l'aponéurose des muscles larges du bas-ventre, les muscles droits, quelquefois l'un des pyramidales, et la paroi antérieure de la vessie.*" (*Tom.* 3, *p.* 318.)

According to my own judgment, the plan, which is about to be described, is the safest and best, when the circumstances of the case afford a choice, and that it would be for the benefit of the afflicted, if the puncture above the pubes were only performed in cases in which the enormous enlargement of the prostate gland prevents a puncture from being safely made from the rectum.

### 3. *Puncture from the Rectum.*

This method is more generally applicable, than either of the two plans above related. It is not, like the puncture in the perinæum, liable to the objection, that the wound is made in diseased or inflamed parts, which afterwards become gangrenous. Nor is it, like the puncture above the pubes, attended with a chance of the urine diffusing itself in the cellular membrane. It has also the advantage of emptying the bladder completely. The puncture is made sufficiently far from the neck of the bladder not to increase any inflammation existing in that situation; and the operation is really attended with little pain, since there is no skin, nor muscles to be wounded, merely the coats of the bladder and rectum, at a point where these viscera lie in contact with each other. The enlargement of the prostate gland, is, perhaps, the only solid reason against its being uniformly preferred.

When the bladder is to be tapped from the rectum, two fingers should be introduced into the intestine, instead of one, as has been directed. In this manner, the cannula can be more conveniently guided, and held in a proper position, while the trocar is introduced with the other hand. The stilette, however, must never be introduced into the cannula, except when this is properly placed, with its extremity against the part, where it is intended to make the puncture.

We read in the *Philosophical Transactions* for 1776, of a case of total retention of urine, from strictures, where the bladder was successfully punctured from the rectum. Mr. Hamilton, who did the operation, thought of the plan, in consequence of feeling the bladder exceedingly prominent in the rectum, on introducing his finger into the anus.

The patient was placed in the same position as that for lithotomy; a trocar was passed along the finger into the anus, and pushed into the lowest, and most projecting part of the swelling, in the direction of the axis of the bladder. A straight catheter was immediately introduced through the cannula, lest the bladder by contracting should quit the latter, which was taken away, and, as soon as the water was discharged, the catheter was also removed. Notwithstanding the puncture, the bladder retained the urine as usual, until a desire to make water occurred. Then the opening made by the instrument seemed to expand, and the water flowed in a full stream from the anus. The urine came away, in this manner, two days, after which it passed the natural way, with the aid of a bougie, which had been passed, through the urethra, into the bladder, and which was used, till all the disease in this canal was cured.

The method is said to have been originally proposed in 1750, by M. Fleurant, surgeon of the hospital *La Charité*, at Lyons, and Pouteau, in 1760, published an account of it, and three cases in which Fleurant had operated. It was also the feel of the bladder, on the introduction of a finger *intra anum*, which led the latter surgeon to choose making a puncture in this situation. The urine was immediately discharged, and the cannula supported in its place with the T bandage, until the natural passage was rendered pervious again. But the cannula, being allowed to remain in the rectum, became incommodious to the patient, when he went to stool, and, the inconvenience was vastly increased by the continual dribbling of the urine from the mouth of the instrument. Hamilton avoided both these inconveniences, by withdrawing the cannula at first. In another instance, however, Fleurant left the cannula in the anus and bladder, thirty-nine days, without the least inconvenience.

In order to lessen the inconvenience, attending the presence of the cannula, Fleurant suggested that it would be better to have the tube made of a flexible substance; a proposal, that seems to merit attention, though, I believe, the inconveniences of wearing the cannula are not in general very serious, and, were a case of this kind to present itself, I should have no hesitation in withdrawing the tube altogether.

In the first volume of the *Mem. of the Medical Society of London*, two cases are related, in which, after tapping the bladder from the rectum, the cannula was immediately withdrawn, without any bad effect. Another similar fact is recorded in the *Medical Communications, Vol.* 1.

A long, curved, cylindrical trocar, is the best for performing the operation, and was the one recommended by Pouteau. It should be introduced a little beyond the prostate gland, exactly in the centre of the front of the rectum, and sufficiently far up this intestine. In this way the vesiculæ seminales, which diverge from each other above, cannot be injured; and, even were they so, perhaps no serious consequences would follow.

It is not necessary to retain the cannula in the puncture, after the inflammation has consolidated the sides of the wound, and there is no danger of the aperture closing up, till there is another passage made for the urine. Sir E. Home thinks, that after about thirty-seven hours, the cannula may be properly taken out. (*Med. and Chir. Trans. Vol.* 2.) Indeed, I am not acquainted with any fact, shewing the ill effect of removing the cannula at once; for, here the urine has only to pass through a mere opening, without any longitudinal extent, as after puncturing above the pubes. The safety and simplicity of tapping the bladder from the rectum, will always recommend this method with impartial practitioners. The wound is made at a distance from the peritoneum, passes through no thickness of parts, and is quite unattended with any chance of the urine becoming extravasated in the cellular substance. Whether the bladder be morbidly contracted and thickened; whether the neck of the bladder be inflamed; it is equally applicable: the diseased enlargement of the prostate gland, can alone warrant the puncture above the pubes being ever preferred.

I am happy to join the experienced and judicious Mr. Hey with the advocates for this mode of performing the operation, and as his opinion on this subject must have considerable influence, I shall quote the following passage from his valuable work, particularly as the observations confirm some other points adverted to in the present article. "It is sometimes impossible, from various causes, to make a catheter pass through the urethra. The puncture of the bladder then becomes necessary, if the retention of urine continues. This operation may be performed, either above the pubes, or through the rectum. I have seen it performed in both these methods; but, give the preference to the latter. It is more easy to the surgeon; and less painful to the patient. Pouteau's carved trocar is a very convenient instrument; and may be used with safety for puncturing the bladder through the rectum; but, the operator should cautiously avoid wounding an artery, which may be felt running towards the anus, where the bladder is most protuberant. The finger, which is introduced into the rectum to guide the trocar, may be conveniently placed a little on either side of this vessel. It is not always necessary to leave the cannula in the bladder, as the urine sometimes begins to flow through the penis, within a few hours after the bladder is emptied. Perhaps, this event may be the most frequent, when the introduction of the catheter has been prevented by a stricture in the urethra. If the wound becomes closed, before the power of expelling the urine is regained, recourse must be had to a repetition of the operation, which gives very little trouble to the patient: neither is he much incommoded by suffering the cannula to remain two or three days in the bladder. This is sometimes necessary, and seldom improper." (*Hey's Practical Observations in Surgery, p.* 430—431, *edit.* 2.)

Women seldom stand in need of the paracentesis of the bladder; but, when the operation is necessary in them, it is more safely and easily performed from the vagina, than in any other way. If it should be proper to leave in the cannula, this must be long enough to allow its orifice to be situated on the outside of the labia, where it must be fixed with a T bandage.

Consult particularly *Sharp on the Operations, Chap.* 15, *and his Critical Enquiry. L'Encyclopédie Méthodique, Partie Chirurgicale; art. Paracentése de la Vessie. Sabatier's Médecine Opératoire, Tom.* 2. *Med. and Chir. Transactions, Vol.* 2. *Abernethy's Surgical Observations*, 1804. *John Bell's Principles of Surgery, Vol.* 2. *Œuvres Chirurgicales de Desault par Bichat, Tom.* 3, *p.* 315, *&c. Richerand's Nosographie Chirurgicale, Tom.* 3, *edit.* 4. *Hey's Practical Observations in Surgery, p.* 430, *edit.* 2. *Melanges de Chirurgie, par Pouteau, Lyon,* 1760, *p.* 500. *Parisian Chirurgical Journal, Vol.* 2, *p.* 156, *and p.* 265. *Callisen's Systema Chirurgiæ Hodiernæ, T.* 2, *p.* 277, &c.

**Bladder**, *Tumour extirpated from.* Mr. Joseph Warner, surgeon of Guy's Hospital, has recorded a case, in which an excrescence, growing from the inside of a young woman's bladder, was successfully removed. The patient, on the 24th of June, 1747, strained herself in endeavouring to lift a great weight, and she was immediately seized with a pain in the small of her back, and a total retention of urine. In April, 1750, she applied to Mr. Warner, who found, upon enquiry, that she had never been able, from the moment of the accident, to void a drop of urine, without the assistance of the catheter; that she was in continual pain, and had lately been much weakened, by having several times lost considerable quantities of blood, occasioned by the force made use of in introducing the instrument into the bladder.

Mr. Warner, upon examining the parts, with his forefinger, which he had great difficulty in introducing into the meatus urinarius, discovered a considerable tumor, which seemed to be of a fleshy substance, and took its rise from the lower part of the bladder near its neck. When the patient strained to make water, and the bladder was full, the excrescence protruded a little way out of the meatus urinarius; but, upon ceasing to strain, it presently returned.

A purgative having been given the day before the operation, and the rectum emptied by means of an emollient clyster, Mr. Warner directed the patient to strain, so as to make the swelling project. He then hindered it from returning into the bladder by passing a ligature through it, and endeavoured to draw it further out. The latter object was found impracticable, on account of the size of the tumour. Seeing this, Mr. Warner dilated the meatus urinarius on the right side, by cutting it upwards, about half way towards the neck of the bladder, when, by pulling the swelling forwards, he was enabled to tie its base, which was very large, with a ligature.

For three days after the operation, a good deal of pain was felt in the abdomen. On the sixth day, the tumour dropped off. From the first day, the urine came away without assistance, and the patient got quite well. The tumour resembled a turkey's egg in shape and size. (See *Warner's Cases in Surgery, edit.* 4, *p.* 303.)

Perhaps, in this example, tying the tumour was preferable to cutting it away, even though its base was large; for, had the knife been used, there would have been some danger of the bladder becoming filled with blood.

Bladder, *Hernia of.* See *Hernia.*

Bladder, *Insects discharged from.* The instances, in which worms are stated to have been discharged from the bladder, are very numerous. Many cases of this kind are referred to in Voigtel's Handbuch der pathologischen Anatomie, b. 3, p. 337—342. A most interesting example has also been lately recorded by Mr. William Lawrence. (See *Medico-Chirurgical Transactions, Vol.* 2, *p.* 382, &c.)

Bladder, *Deficiency of.* Numerous examples, in which this deviation from the natural structure has occurred, are recorded by medical writers. The publications, however, which, as far as I know, contain the most ample information on the subject, are, a Gottingen inaugural dissertation, entitled, "*De Vesicæ Urinariæ Prolapsu Nativo,*" by Dr. Roose, late professor in Brunswick, and a paper, called "*An attempt towards a systematic account of the appearances, connected with that malconformation of the Urinary Organs, in which the ureters, instead of terminating in a perfect bladder, open externally on the surface of the Abdomen,*" *by A. Duncan, jun. in Edinb. Med. and Surgical Journal, Vol.* 1. In this last production, may be seen references to all the most noted cases on record, both male and female.

Bladder, *Wounds of.* See *Gunshot Wounds.*

BLEEDING. By this operation is understood the taking away of blood for the relief of diseases. Bleeding is called *general*, when practised with a view of lessening the whole mass of circulating blood; *topical*, when performed in the vicinity of the disease, for the express purpose of lessening the quantity of blood in a particular part.

*General Blood-letting* is performed with a lancet, and is subdivided into two kinds; viz. the opening of a vein, termed *phlebotomy*, or *venesection;* and the opening of the temporal artery, or one of its branches, termed *arteriotomy*.

*Topical Blood-letting* is performed, either by means of a cupping-glass and scarificator, or leeches, or by dividing the visibly distended vessels with a lancet. The latter is frequently done in cases of ophthalmy.

### PHLEBOTOMY, OR VENESECTION.

The mode of bleeding most frequently practised is that of opening a vein; and it has been done in the arm, ankle, jugular vein, frontal vein, veins under the tongue, on the back of the hand, &c. In whatever part, however, venesection is performed, it is always necessary to compress the vein, between the place where the puncture is made, and the heart. Thus the return of blood through the vein is stopped, the vessel swells, becomes conspicuous, and, when opened, bleeds much more freely than it would otherwise do. Hence, according to the situation of the part of the body where the vein is to be opened, with regard to the heart, the fillet for making the necessary pressure must be applied, either above or below the puncture.

All the apparatus essential for blood-letting, on the part of the patient, is a bandage, or fillet, two or more small pieces of folded linen for compresses, a basin to receive the blood, and a little clean water and a towel. The bandage ought to be about a yard in length, and near two inches broad, a common riband or garter, being frequently employed. The compresses are made by doubling a bit of linen rag, about two inches square. On the part of the surgeon, it is necessary to have a good lancet, of proper shape. He should never bleed with lancets, with which he has been in the habit of opening any kind of abscesses, as very troublesome complaints have been the consequence of doing so. The shape of the instrument is also a matter of some importance. If its shoulders are too broad, it will not readily enter the vein, and when it does enter, it invariably makes a large opening, which is not always desirable. If the lancet be too spear-pointed, an incautious operator would often run a risk of transfixing the vein, and wounding the artery beneath it. More, however, certainly depends on the mode of introducing the lancet, than on its shape.

In blood-letting, the patient may lie down, sit down, or stand up, each of which positions may be chosen according to circumstances. If the patient be apt to faint from the loss of a small quantity of blood, and such fainting can answer no surgical purpose, it is best to bleed him in a recumbent posture. But, when the person is strong and vigorous, there is little occasion for this precaution, and a sitting posture is to be preferred, as the most convenient, both for the surgeon and patient. This, indeed, is the common position. In some cases, however, particularlarly those of strangulated hernia, it is frequently an object to produce fainting, in order that the bowels may be more easily reduced. In this circumstance the patient may be bled in an erect posture, and the wound made large, as a sudden evacuation of blood is particularly apt to bring on the wished for swoon. For the same reason, if we wish to avoid making the patient faint, we should then make only a small puncture.

Every operator should be able to use the lancet with either hand, which will enable him to bleed the patient in the right or left arm, as circumstances may render most eligible.

At the bend of the arm, there are several veins in which a puncture may be made; viz. the basilic, cephalic, median basilic, and median cephalic. The median basilic vein, being usually the largest and most conspicuous, is that, in which the operation is mostly performed; but surgeons should never forget, that it is under this vessel that the brachial artery runs, with the mere intervention of the aponeurosis sent off from the tendon of the biceps muscle. In very thin persons, indeed, the median basilic vein lies almost close to the artery, and nothing is then more easy than to transfix the first of these vessels and wound the last. Hence, Richerand advises all beginners to prefer opening the median cephalic, or even the trunk of the cephalic itself, to puncturing either the basilic, or the median basilic, which last are internally situated, and nearer the brachial artery. (*Nosographie Chirurgicale, Tom.* 3, *p.* 383, *Edit.* 2.)

In fat subjects, the large veins at the bend of the arm are sometimes totally imperceptible, notwithstanding the fillet is tightly applied, the limb is put in warm water, and every thing done to make those vessels as turgid as possible. In this circumstance, if the surgeon has not had much experience in the practice of venesection, he will do well to be content with opening one of the veins of the back of the hand, after putting the member for some time in warm water, and applying a ligature round the wrist. In children, a sufficient quantity of blood cannot always be obtained by venesection, and, in this event, the free application of leeches, and, occasionally, the puncture of the temporal artery, are the only effectual methods.

With respect to the choice of a vein in the arm, the most experienced operators give a preference to one, which rolls least under the skin. Such a vessel, though sometimes less superficial, than another, may commonly be opened with greater facility. The surgeon, however, is always to fix the vein, as much as he can, by placing the thumb of his left hand a little below the place, where he intends to introduce the lancet.

In bleeding in the arm, the fillet is to be tied round the limb, a little above the elbow, with sufficient tightness to intercept the passage of the blood through all the superficial veins; but, never so as to stop the flow of blood through the arteries, which would tend to prevent the veins from rising at all. The veins being thus rendered turgid, the surgeon must choose the one which seems most conveniently situated for being opened, and large enough to furnish as much blood as it may be proper to take away.

Before applying the fillet round the arm, however, the operator should always feel where the pulsation of the artery is situated, and, if equally convenient, he should not open the vein immediately over this part. It is also prudent to examine where a pulsation is situated, on account of the occasional varieties in the distribution of the arteries of the arm. The ulnar artery is sometimes given off from the brachial very high up, and, in this case, it frequently proceeds superficially over the muscles, arising from the internal condyle, instead of diving under them, in the ordinary manner.

When the external jugular vein is to be opened, the surgeon generally makes the necessary pressure with his thumb. The orifice should be made in the direction of the fibres of the platysma myoides muscle; and the vein is not so apt to glide out of the way, when the surgeon makes the puncture just where it lies over a part of the sterno-cleido-mastoideus muscle.

When blood is to be taken from the foot, the ligature is commonly applied a little above the ankle.

The fillet having been put on the arm, the operator is to take the blade of the lancet, bent to a somewhat acute angle, between the thumb and fore-finger, and, steadying his hand upon the other three fingers, he is to introduce the lancet, in an oblique direction, into the vessel, till the blood rises up at the point of the instrument. Then bringing up the front edge in as straight a line as possible, the wound in the skin will be made of just the same size as that in the vein. The operator next takes away the thumb of his left hand, with which he steadied the vessel, and allows the blood to escape freely, till the desired quantity is obtained. The arm ought to be kept in the same position while the blood is escaping, lest the skin should slip over the orifice of the vein, keep the blood from getting out, and make it insinuate itself into the cellular substance.

When the blood does not issue freely, however, most surgeons direct the patient to move his fingers, or turn something round and round in his hand. This puts the muscles of the arm into action, and the pressure, they then make on the veins, makes the blood circulate more briskly through these vessels.

The proper quantity of blood being discharged, the fillet is to be untied. The flow of blood now generally ceases; though sometimes, when the orifice is large, and the circulation very vigorous, it still continues. In this circumstance, the operator may immediately stop the bleeding, by placing the thumb of his left hand firmly on the vessel, a little below the puncture.

The blood is next to be all washed off the arm, the sides of the wound placed in contact, and the compresses applied, and secured with the fillet, put round the elbow in the form of a figure of 8, and regularly crossing just over the compresses.

The patient should be advised not to move his arm much, till the fillet is removed, which may be done after twenty-four hours.

In order to open the external jugular vein, the patient's head is to be laid on one side, and properly supported. Then the operator is to press upon the lower part of the vein with his thumb, so as to make the part above swell, and then the lancet is to be pushed at once into the vessel, with the cautions already stated.

There is commonly no difficulty in stopping the bleeding, after the pressure is removed. Some practitioners have directed a scalpel to be used for dividing the integuments, before opening the vein itself; but, this is quite unnecessary.

Blood-letting in the feet is executed on the same principle as in other parts; but, the blood from the veins in this situation, in general not flowing with much celerity, it is customary to immerse the feet in warm water, in order to promote the bleeding.

### ARTERIOTOMY.

The only arteries from which blood is ever taken in practice, are the trunk and branches of the temporal artery, which lie in such a situation, that they may easily be compressed against the subjacent bones, and the bleeding stopped. When the vessel which the surgeon chooses to open, lies very near the surface, or can be ascertained by feeling, or even seeing, its pulsation, it may be opened at once with a lancet. But, in many instances, it is so deeply situated, that it becomes necessary, in the first place, to make a cut in the skin, and then puncture the vessel.

The bleeding generally stops without any trouble; and may always be suppressed with a compress and bandage. In a very few cases, the blood bursts forth from time to time, and more is lost than is necessary. When this happens, notwithstanding pressure, it is recommended to divide the vessel completely across, which facilitates the process of nature in closing the end of the vessel.

### TOPICAL BLEEDING.—CUPPING.

This is done by means of a scarificator, and a glass, shaped somewhat like a bell. The scarificator is an instrument containing a number of lancets, sometimes as many as twenty, which are so contrived, that when the instrument is applied to any part of the surface of the body, and a spring is pressed, they suddenly start out, and make the necessary punctures. The instrument is also so constructed, that the depth to which the lancets penetrate, may be made greater, or less, at the option of the practitioner. As only small vessels can be thus opened, a very inconsiderable quantity of blood would be discharged, were not some method taken to promote the evacuation. This is commonly done with a cupping-glass, the air within the cavity of which is rarified by the flame of a little lamp, containing spirit of wine, or as some choose, by setting on fire a piece of tow, dipped in this fluid, and put in the cavity of the glass. When the mouth of the glass is placed over the scarifications, and the rarified air in it becomes condensed, as it cools, the glass is forced down on the skin, and a considerable suction takes place.

Trials have been made of syringes, calculated for exhausting the air from cupping-glasses; but the plan is not found so convenient as the one we have described.

When the glass becomes moderately full, and it is desirable to take away more blood, it is best to remove it and put on another one.

A common pledget is usually applied as a dressing for the punctures made with the scarificator.

### LEECHES.

Leeches are often preferable to cupping, which is attended with more irritation than many surfaces, in particular circumstances, can bear, especially when the topical bleeding is to be frequently repeated.

Leeches occasionally cannot be easily made to fix on the particular part we wish; but, they will do so, if the place be first cooled with a cloth dipped in cold water, or if it be moistened with cream or milk, and they are confined in the situation with a small glass. When they fall off, the bleeding may be promoted, if necessary, by fomenting the part.

### SCARIFICATION WITH A LANCET

is mostly done in cases of inflamed eyes. An assistant is to raise the upper eye-lid, while the surgeon himself depresses the lower one, and makes a number of slight scarifications, where the vessels seem most turgid, trying particularly to cut the largest completely across.

### DRY-CUPPING.

We may here mention this simple operation, performed by rarifying the air in a cupping-glass, as above directed, and then applying the vessel to the part affected. A cupping-glass, furnished with a syringe, might answer for this purpose. I think this operation is now not much used in this country: a proof that it is not very efficacious.

## III. CONSEQUENCES SOMETIMES FOLLOWING BLEEDING IN THE ARM.

### 1. *Ecchymosis.*

The most common is a thrombus, or ecchymosis, a small tumour around the orifice, and occasioned by the blood insinuating itself into the adjoining cellular substance, at the time when this fluid is flowing out of the vessel. Changing the posture of the arm will frequently hinder the thrombus from increasing in size, so as to obstruct the evacuation of blood. But, in some instances, the tumour suddenly becomes so large, that it entirely interrupts the operation, and prevents it from being finished. In these cases, however, the most effectual method of preventing the tumour from becoming still larger, is to remove the bandage. By allowing the bandage to remain, a very considerable swelling may be induced, and such as might be attended with great trouble. If more blood be required to be taken away, it ought to be drawn from another vein, and, what is still better, from a vein in the other arm.

The best applications for promoting the absorption of these tumours, are those containing spirit, vinegar, or sal ammoniac. Compresses, wetted with any lotion of this sort, may be advantageously put on the swelling, and confined there with a slack bandage.

### 2. *Inflammation of the Integuments and subjacent cellular Substance.*

According to Mr. Abernethy the inflammation and suppuration of the cellular substance, in which the vein lies, are the most frequent occurrences. On the subsidence of this inflammation, the tube of the vein is free from induration. Sometimes the inflammation is rather indolent, producing a circumscribed, and slowly suppurating tumour. Sometimes it is more diffused, and partakes of the erysipelatous nature. On other occasions, the affection is of the phlegmonous kind.

When the lancet has been bad, so as rather to have lacerated, than cut the parts; when the constitution is irritable, and especially, when care is not taken to unite the edges of the puncture, and the arm is allowed to move about, so as to make the two sides of the wound rub against each other; inflammation will most probably ensue. The treatment of this case consists in keeping the arm perfectly at rest in a sling, applying the saturnine lotion, and giving one or two mild saline purges. When suppuration takes place, a small poultice is the best local application.

### 3. *Absorbents inflamed.*

Sometimes, particularly when the arm is not kept properly quiet after bleeding, swellings make their appearance about the middle of the arm, over the large vessels, and on the fore-arm, about the mid-space, between the elbow and wrist, in the integuments covering the flexor muscles. The swelling at the inner edge of the biceps is sometimes as large as an egg. Before such swellings take place, the wound in the vein often inflames, becomes painful and suppurates, but without any perceptible induration of the venal tube, either at this time, or after the subsidence of the inflammation. Pains are felt shooting from the orifice in lines, up and down the arm, and upon pressing in the course of this pain, its degree is increased. On examining the arm attentively, indurated absorbents may be plainly felt leading to the tumour at the side of the biceps muscle.

The pain and swelling often extend to the axilla, where the glands also sometimes enlarge. Chord-like substances, evidently absorbents, may sometimes be felt, not only leading from the puncture to the swelling in the middle of the arm, but also from this latter situation up to the axillary glands, and from the wound in the vein down to the enlarged glands of the mid space between the elbow and wrist, over the flexor muscles of the hand.

The enlarged glands very often proceed to suppuration, and the patient suffers febrile symptoms. Some may suspect that the foregoing consequences may arise from the lancet being envenomed, and from the absorption of the virulent matter; but the frequent descent of the disease to the inferior absorbents militates against this supposition.

When the absorbents become inflamed, they quickly communicate the affection to the surrounding cellular substance. These vessels, when indurated, appear like small chords, perhaps of one eighth of an inch in diameter: this substance cannot be the slender sides of the vessels, suddenly increased in bulk, but an induration of the surrounding cellular substance.

The inflammation of the absorbents, in consequence of local injury, is deducible from two causes: one, the absorption of irritating matter; and the other, the effect of the mere irritation of the divided tube. When virulent matter is taken up by the absorbents, it is generally conveyed to the next absorbent gland, where its progress being retarded, its stimulating qualities give rise to inflammation, and, frequently, no evident disease of the vessel, through which it has passed, can be distinguished.

When inflammation of the absorbents happens in consequence of irritation, the part of the vessel nearest the irritating cause, generally suffers most, while the glands, being remotely situated, are not so much inflamed.

The treatment of the preceding case consists in keeping the arm perfectly quiet in a sling, dressing the puncture of the vein with any mild simple salve, covering the situation of the inflamed lymphatics with linen wet with the saturnine lotion, and giving some gentle purging medicine.

When the glandular swellings suppurate, poultices should be applied, and if the matter does not soon spontaneously make its way outward, the surgeon may open the abscess. (See *Abernethy's Essay on this subject.*)

### 4. *Inflammation of the Vein.*

The vein itself is very likely to inflame, when the wound does not unite. This affection will vary in its degree, extent, and progress. One degree of inflammation may only cause a slight thickening of the venal tube, and an adhesion of its sides. Abscesses, more or less extensive, may result from an inflammation of greater violence, and the matter may sometimes become blended with the circulating fluids, and produce dangerous consequences, or the matter may be quite circumscribed, and make its way to the surface. When the vein is extensively inflamed, a good deal of sympathetic fever is likely to ensue, not merely from the excitement, which inflammation usually produces, but also in consequence of the irritation continued along the membranous lining of the vein to the heart. If, however, the excited inflammation should fortunately produce an adhesion of the sides of the vein to each other, at some little distance from the wounded part, this adhesion will form a boundary to the inflammation, and prevent it spreading further. The effect of the adhesive inflammation in preventing the extension of inflammation along membranous surfaces has been ably explained by Mr. Hunter. In one case, Mr. Hunter applied a compress to the inflamed vein, above the wounded part, and he thought that he thus succeeded in producing an adhesion, as the inflammation was prevented from spreading further. When the inflammation does not continue equally in both directions, but descends along the course of the vein, its extension in the other direction is probably prevented by the adhesion of the sides of the vein to each other. (See *Mr. Hunter's Paper in the Med. and Chirurg. Transactions, Vol.* 1.)

Mr. Abernethy mentions his having seen only three cases, in which an inflammation of the vein succeeded venesection. In neither of these did the vein suppurate. In one, about three inches of the venal tube inflamed both above and below the puncture. The integuments over the vessel were very much swollen, red, and painful, and there was a good deal of fever, with a rapid pulse, and furred tongue. The vein did not swell, when compressed above the diseased part. In another instance, the inflammation of the vein did not extend towards the heart, but only downward, in which direction it extended as far as the wrist.

The treatment is to lessen the inflammation of the vein, by the same means, which other inflammations require, and to keep the affection from spreading along the membranous lining of the vessel, towards the heart, by placing a compress over the vein, a little way above the puncture, so as to make the opposite sides of the vessel adhere together.

Mr. Abernethy can conceive a case, in which the vein may even suppurate, and a total division of the vessel might be proper, not merely to obviate the extension of the local disease, but to prevent the pus from becoming mixed with the circulation.

Might it not be better to put a ligature under the suppurating vein, above the affected part of the vessel? This plan would be quite effectual, without the objection of hemorrhage.

### 5. *Inflammation of the Fascia of the Fore-Arm.*

Sometimes, in consequence of the inflammation arising from the wound of the lancet in bleeding, the arm becomes very painful, and can hardly be moved. The puncture often remains unhealed, but, without much inflammation of the surrounding integuments. The fore-arm and fingers cannot be extended without great pain. The integuments are sometimes affected with a kind of erysipelas; being not very painful, when slightly touched, but when forcibly compressed, so as to affect the inferior parts, the patient suffers a good deal. The pain frequently extends towards the axilla and acromion; no swelling, however, being perceptible in either direction. These symptoms are attended with considerable fever. After about a week, a small superficial collection of matter sometimes takes place a little below the internal condyle: this being opened, a very little pus is discharged, and there is scarcely any diminution of the swelling or pain. Perhaps, after a few days more, a fluctuation of matter is distinguished below the external condyle, and this abscess being opened, a great deal of matter gushes from the wound, the swelling greatly subsides, and the patient's future sufferings are comparatively trivial.

The last opening, however, is often inadequate to the complete discharge of the matter, which is sometimes originally formed beneath the fascia, in the course of the ulna, and its pointing at the upper part of the arm depends on the thinness of the fascia in this situation. The collection of pus descends in the lower part of the detached fascia, and a depending opening for its discharge becomes necessary. This being made, the patient soon gets well.

In these cases, neither the vein, nor the absorbents, appear inflamed. The integuments are not much affected, and the patient complains of a tightness of the fore-arm. Matter does not always form, and the pliability of the arm, after a good while, gradually returns again.

Mr. Watson relates a case, which was followed by a permanent contraction of the fore-arm. Mr. Abernethy is of opinion, that a similar contraction of the fore-arm, from a tense state of the fascia, may be relieved by detaching the fascia from the tendon of the biceps, to which it is naturally connected. Mr. Watson seems to have obtained success in his first case, by having cut this connexion.

The treatment of an inflamed fascia, in consequence of venesection, has in it no peculiarity. General means for the cure of inflammation should be employed. The limb should be kept quiet, and the inflamed part relaxed. As soon as the inflammation abates, the extension of the fore-arm and fingers ought to be attempted, and daily performed, to obviate the contraction, which might otherwise ensue. (*Abernethy.*)

Mr. Charles Bell objects to calling the affection an inflammation of the fascia, because he sees no proof of this part being inflamed, and he conceives that the symptoms proceed from the inflammation spreading in the cellular membrane, and passing down among the muscles, and under the fascia. The fascia acts as a bandage, and from the swelling of the parts beneath, it binds the arm, but is not itself inflamed, and contracted. When necessary to divide the fascia, Mr. Charles Bell thinks it would be better to begin an incision near the inner condyle of the humerus, and to continue it some inches down the arm, rather than perform the nice, if not dangerous operation, of cutting the fascia, at the point, where the expansion goes off from the round tendon of the biceps.

When the elbow-joint and fore-arm continue stiff after all inflammation is over, Mr. C. Bell recommends frictions with camphorated mercurial ointment, &c. and the arm to be gradually brought into an extended state by placing a splint on the fore part of the limb. (*Operative Surgery, Vol. 1, p. 65.*)

### 6. *Ill Consequences of a wounded Nerve.*

Mr. Abernethy informs us, that Mr. Pott used to mention two cases, in which the patients had suffered distracting pains, followed by convulsions and other symptoms, which could only be ascribed to nervous irritation, arising from a partial division of the nerve, and he recommended its total division, as a probable remedy. Dr. Monro is said to relate similar cases, in which such treatment has proved successful.

Hence, it is highly necessary to know

the characteristic symptoms of the case, particularly, as all the foregoing cases would be exasperated by the treatment just now alluded to. It is to Mr. Abernethy that we are indebted for several valuable remarks elucidating this subject. He informs us, that the two cutaneous nerves are those which are exposed to injury. Most frequently all their branches pass beneath the veins, at the bend of the arm; but sometimes, although the chief rami go beneath these vessels, many small filaments are detached over them, which it is impossible to avoid wounding in phlebotomy.

Mr Abernethy thinks the situation of the median nerve, renders any injury of it very unlikely. If, however, a doubt should be entertained on this subject, an attention to symptoms will soon dispel it. When a nerve is irritated at any part, between its origin and termination, a sensation is felt, as if some injury were done to the parts, which it supplies. If, therefore, the cutaneous nerves were injured, the integuments of the fore-arm would seem to suffer pain; if the median nerve, the thumb, and two next fingers, would be painfully affected.—(*Abernethy.*)

What are the ills likely to arise from a wounded nerve? If it were partially cut, would it not, like a tendon, or any other substance, unite? It seems probable that it would do so, as nerves, as large as the cutaneous ones of the arm, are very numerous in various situations of the body, and are partially wounded in operations, without any peculiar consequences usually ensuing. The extraordinary pain sometimes experienced in bleeding, may denote that a cutaneous nerve is injured. The situation of the nervous branches is such, that they must often be partially wounded in the operation, though they probably unite again, in almost all cases, without any ill consequences. Yet, says Mr. Abernethy, it is possible that an inflammation of the nerve may accidentally ensue, which would be aggravated, if the nerve were kept tense, in consequence of its impartial division. Mr. Abernethy thinks the disorder arises from inflammation of the nerve, in common with the other wounded parts. Every one will admit that an inflamed nerve would be very likely to communicate dreadful irritation to the sensorium, and that a cure would be likely to arise from intercepting its communication with that organ.

The general opinion is, that the nerve is only partially divided, and that a complete division would bring relief. Mr. Pott proposed enlarging the original orifice. It is possible, however, that the injured nerve may be under the vein, and, if the nerve be inflamed, even a total division of it, at the affected part, would, perhaps, fail in relieving the general nervous irritation, which the disease has occasioned. To intercept the communication of the inflamed nerve with the sensorium, does, however, promise perfect relief. This object can only be accomplished by making a transverse incision above the orifice of the vein. The incision need not be large, for the injured nerve must lie within the limits of the original orifice, and it need only descend as low as the fascia of the fore-arm, above which all the filaments of the cutaneous nerves are situated. As the extent of the inflammation of the nerve is uncertain, Mr. Abernethy suggests even making a division of the cutaneous nerve still further from the wound made in bleeding.

Examples are recorded, in which not only extraordinary pain was occasioned by the prick of the lancet; but, erysipelas of the skin seemed to be induced by the operation, ending in gangrene of the whole limb, and the death of the patient. (See *Richerand's Nosographie Chirurgicale, Tom.* 2, *p.* 390, *Edit.* 2.)

In former times, it was customary to refer many of the bad symptoms occasionally following venesection, to a puncture of the tendon of the biceps; but, this doctrine is now in a great measure renounced, the experiments of Haller having completely proved, that tendons and aponeuroses are, comparatively speaking, parts endued with little or no sensibility.

In the foregoing account, the various ill consequences occasionally arising, after venesection, are represented separately; no doubt, in some cases, they may occur together.

(See *Essay on the ill Consequences, sometimes following Venesection, by J. Abernethy, F.R.S. Medical and Chirurgical Transactions, Vol.* 1. *Medical Communications, Vol.* 2. *Richerand's Nosographie Chirurgicale, Tom.* 2, *p.* 416, *Edit.* 4.)

**BLEEDING.** (See *Hemorrhage.*)

**BLE'NORRHAGIA,** or *Blénorrhœa.* (from βλεννος, mucus, and ϱεῶ, to flow.) A discharge of mucus. Swediaur, who maintains, that the gonorrhæa is attended with a mucous, and not a purulent discharge, prefers the name of blenorrhagia for the disease. However, in treating of gonorrhæa, we shall find that this last appellation is itself not altogether free from objections.

**BLEPHAROPTOSIS.** (from βλεφαρον, the eyelid, and πτωσις, a falling down.) Called also *ptosis.* An inability to raise the upper eyelid. (See *Ptosis.*)

**BLEPHARO'TIS.** An inflammation of the eyelids.

**BLINDNESS.** This is an effect of many diseases of the eye. See, particularly, *Amaurosis; Cataract; Cornea, opacities of; Hydrophthalmia; Leucoma; Ophthalmy; Pterygium; Pupil, closure of; Staphyloma, &c.*

**BLISTERS.** Topical applications, which, when put on the skin, raise the cuticle in the form of a vesicle, filled with a serous fluid. Various substances produce this effect on the skin; but, the powder of cantharides is what operates with most certainty and expedition, and, is now invariably made use of for the purpose. The blister plaster is thus composed: ℞ *Cantharidum* lbj, *Emplastri ceræ* lbij. *Adipis suillæ præp.* lbss. The wax plaster and lard being melted, and allowed to become nearly cold, the powdered cantharides are afterwards to be added.

When it is not wished to maintain a discharge from the blistered part, it is sufficient to make a puncture in the cuticle to let out the fluid; but, when the case requires keeping up a secretion of pus, the surgeon must remove the whole of the detached cuticle with a pair of scissars, and dress the excoriated surface in a particular manner. Practitioners used formerly to mix powder of cantharides with an ointment, and dress the part with this composition. But, such a dressing not unfrequently occasioned very painful affections of the bladder, a scalding sensation in making water, and most afflicting stranguries. An inflammation of the bladder, ending fatally, has been thus excited. The treatment of such complaints consists in removing every particle of cantharides from the blistered part, making the patient drink abundantly of mucilaginous drinks, giving emulsions, and some doses of camphor.

These objections to the employment of salves, containing cantharides, for dressing blistered surfaces, led to the use of mezereon, euphorbium, and other irritating substances, which, when incorporated with ointment, form very proper compositions for keeping blisters open, without the inconvenience of irritating the bladder, like cantharides.

The favourite application, however, for keeping open blisters, is the powder of savine, which was brought into notice by Mr. Crowther, in the first edition of his book on the White Swelling. In the last edition, this gentleman remarks, that he was led to the trial of different escharotic applications, in the form of ointment, in consequence of the minute attention, which caustic issues demand; and among other things, he was induced to try powdered savine, from observing its effects in the removal of warts. Some of the powder was first mixed with white cerate, and applied as a dressing to the part, that had been blistered; but, the ointment ran off, leaving the powder dry upon the sore, and no effect was produced. Mr. Crowther next inspissated a decoction of savine, and mixed the extract with the ointment, which succeeded better, for it produced a great and permanent discharge. At last, after various trials, he was led to prefer a preparation analogous to the unguentum sambuci P. L. and he now offers the following formula, as answering every desirable purpose: ℞ *Sabinæ recentis contusæ* lbij, *Ceræ flavæ* lbj, *Adipis suillæ* lbiv. *Adipe et cera liquefactis, incoque sabinam et cola.*

The difference of this formula from that, which Mr. Crowther published in 1797, only consists in using a double proportion of the savine leaves. The ceratum sabinæ of Apothecary's Hall, he says, is admirably made: the fresh savine is bruised with half the quantity of lard, which is submitted to the force of an iron press, and the whole is added to the remainder of the lard, which is boiled until the herb begins to crisp; the ointment is then strained off, and the proportion of wax, ordered, being previously melted, is added. On the use of the savine cerate, immediately after the cuticle, raised by the blister, is removed, it should be observed, says Mr. Crowther, that experience has proved the advantage of using the application lowered by a half, or two-thirds, of the unguentum ceræ. An attention to this direction will produce less irritation, and more discharge, than if the savine cerate were used in its full strength. Mr. Crowther says also, that he has found fomenting the part with flannel wrung out of warm water, a more easy, and preferable way of keeping the blistered surface clean, and fit for the impression of the ointment, than scraping the part, as has been directed by others. An occasional dressing of the unguentum resinæ flavæ, he has found, a very useful application for rendering the sore free from an appearance of slough, or rather dense lymph, which has sometimes been so firm in its texture, as to be separated by the probe, with as much readiness, as the cuticle is detached after blistering. As the discharge diminishes, the strength of the savine dressing should be proportionally increased. The ceratum sabinæ must be used, in a stronger, or weaker degree, in proportion to the excitement produced on the patient's skin. Some require a greater stimulus, than others, for the promotion of the discharge, and this can only be managed by the sensations, which the irritation of the cerate occasions.

Mr. Crowther has used ointments, containing the flowers of the clematis recta, the capsicum, and the leaves of the digitalis purpurea. The two first produced no effect: the last was very stimulating;

and Mr. Crowther mentions his intention to take the first convenient opportunity to determine its qualities more accurately. He has also used kali purum, rubbed down with spermaceti cerate, in the proportion of one dram to an ounce: it proved very stimulating, but produced no discharge. He has tried one dram of the hydrargyrus muriatus mixed with two ounces of the above cerate; but, the application was so intolerably painful, that Mr. Crowther was sent for at the end of two hours, and found it necessary immediately to remove the dressing. The patient was attacked with the most severe ptyalism Mr. Crowther ever witnessed. (*Practical Observations on the White Swelling, &c. a new edition, by B. Crowther*, 1808.)

Instead of keeping a blister open, it is frequently a judicious plan to renew the application of the emplastrum lyttæ (the new name now adopted for blistering plaster) after healing up the vesication first produced, and to continue, in this manner, a succession of blisters, at short intervals, as long as the circumstances of the case may demand.

BOIL. (See *Furunculus.*)

BOUGIE. (French for Wax Candle.) This signifies an instrument somewhat resembling a straight piece of wax-taper, and the chief use of which is to remove obstructions in the urethra, by being introduced into this canal. The composition, of which they are made, ought, in particular, to possess a certain degree of suppleness, combined with a good deal of firmness.

Scultetus, a practitioner and writer of great note, at Ulm, in Germany, about the middle of the seventeenth century, was not ignorant of the manner of making and using bougies, in diseases of the urethra, as appears in his Armamentarium Chirurg. tab. 13, fig. 9, 10. And from his invention, as Mr. Gooch has observed, it is not at all improbable, that Daran may have taken the hint, and improved upon it.

The making of bougies has now become so distinct a trade, that some surgeons may consider it superfluous to treat of the subject in this dictionary. However, though a surgeon may not actually choose to take the trouble of making bougies himself, he ought certainly to understand how they ought to be made. Swediaur recommends the following composition: ℞ Ceræ flavæ lbj, Spermatis ceti ʒiij, Cerussæ acetatæ ʒv. These articles are to be slowly boiled together, till the mass is of proper consistence. Mr. B. Bell's bougie plaster is thus made: ℞ Emplastri lythargyri ℥iv, Ceræ flavæ ℥iss, Olei Olivæ ʒiij. The two last ingredients are to be melted in one vessel, and the litharge plaster in another, before they are mixed. In Wilson's Pharmacopœia Chirurgica, I observe this formula: ℞ Olei Olivæ lbiiss, Ceræ flavæ lbj, Minii lbiss. Boil the ingredients together over a slow fire, till the minium is dissolved, which will be in about four or six hours. The composition for bougies is now very simple, as modern surgeons place no confidence in the medicated substances, formerly extolled so much by the famous Daran. The linen, which may be considered as the basis of the bougie, is impregnated with the composition alluded to, and which we see is generally made of wax and oil, rendered somewhat firmer by a proportion of resin. Some saturnine preparation is commonly added, as the urethra is in an irritable state, and the mechanical irritation might otherwise increase it. Of whatever composition bougies are made, they must be of different sizes, from that of a knitting-needle to that of a large quill, and even larger. The common ones are made in the following manner. Having spread any composition, chosen for the purpose, on linen rag, cut this into slips, from six to ten inches long, and from half an inch, to an inch, or more in breadth. Then dexterously roll them on a glazed tile into the proper cylindrical form. As the end of the bougie, which is first introduced into the urethra, should be somewhat smaller than the rest, the slips must be cut rather narrower in this situation, and, when the bougies are rolled up, that side must be outward, on which the plaster is spread.

Mons. Daran, and some others, attributed the action of their bougies to the composition used in forming them. Mr. Sharp apprehended that their efficacy was chiefly owing to the pressure, which they made on the affected part; and Mr. Aikin adds, that as bougies of very different compositions succeed equally well in curing the same diseases in the urethra, it is plain, that they do not act from any peculiar qualities in their composition, but by means of some common property, probably, their mechanical form.

There certainly is a great objection to making bougies of very active materials; because the healthy, as well as the diseased, parts are exposed to their action. Hence, surgeons now prefer the common bougies, made of a simple unirritating composition.

Plenck recommended bougies of catgut, which may be easily introduced even into a urethra greatly contracted, as their size is small, their substance firm, and they dilate with moisture. It is objected to catgut, however, that it dilates very much beyond the stricture, and gives great pain on being withdrawn.

The elastic resin has been employed for this purpose with great success, as it unites firmness and flexibility. The resin is moulded on catgut by some secret method. Mr. Wilson, in his Pharmacopœia Chirurgica, seems to suggest, with much appearance of probability, that the secret consists in finding a suitable solvent for the Indian gum. As this substance, if dissolved in æther, completely recovers its former elasticity, upon the evaporation of this fluid, it is supposed that æther would answer the purpose, though rather too expensive. The catgut is coated with the elastic matter by being repeatedly dipped in it. Elastic gum bougies are in many cases highly serviceable, though their surface soon becomes rough, and they are expensive.

The best elastic gum bougies, which I have ever seen, are those made by M. Feburier, No. 51, Rue du Bac at Paris. He has twelve different sizes. His elastic gum catheters are also beautifully made. This ingenious artist does not employ catgut in the composition of the elastic gum-bougies, for which he is so celebrated. M. Feburier's bougies are most excellent, when you can get them to pass; for they dilate the stricture with the least possible irritation. But, sometimes, they cannot be introduced, when a wax bougie can; and from the trials I have made of them, I conceive this arises from their elasticity and continual tendency to become straight, when they reach the perinæum, so that the point presses on the lower surface of the urethra. Hence, when the obstruction is on that side, it must be very difficult to get the end of the bougie over it.

Mr. Smyth, apothecary, of Tavistock-street, has discovered a metallic composition, of which he forms bougies, to which some practitioners impute very superior qualities. These bougies are flexible, have a highly polished surface, of a silver hue, and possess a sufficient degree of firmness for any force, necessary in introducing them for the cure of strictures in the urethra. The advocates for the metallic bougies assert, that such instruments exceed any bougies, which have yet been invented, and are capable of succeeding in all cases, in which the use of a bougie is proper. They are made either solid, or hollow, and answer extremely well as catheters; for, they not only pass into the bladder with ease, but may also be continued there for any convenient space of time, and hence produce the most essential benefit. The bougies certainly do not swell with moisture. The greatest objection, which has been urged against them, is, that they are attended with a risk of breaking. I have heard of an eminent surgeon being called upon to cut into the bladder, in consequence of a metallic bougie having broken, and a piece of it got into that organ, where it became a cause of the severe symptoms, which are commonly the effect of a stone in the bladder. It has also been objected to metallic bougies, that, although they are sufficiently flexible, they are quite destitute of elasticity.

See Sharp's Critical Enquiry, ch. 4. Aikin on the external use of Lead. Bell's Surgery, Vol. 2, &c. White's Surgery, 371.

The bougie, with its application, says Mr. Hunter, is perhaps one of the greatest improvements in surgery, which these last thirty, or forty years have produced. When I compare the practice of the present day, with what it was in the year 1750, I can scarcely be persuaded, that I am treating the same disease. I remember, when, about that time, I was attending the first hospitals in the city, the common bougies were, either a piece of lead, or a small wax candle, and, although the present bougie was known then, the due preference was not given to it, nor its particular merit understood, as we may see from the publications of that time.

Daran was the first, who improved the bougie, and brought it into general use. He wrote professedly on the diseases for which it is a cure, and also of the manner of preparing it; but, he has introduced much absurdity into his descriptions of the diseases, the modes of treatment, and the powers and composition of his bougies.

When Daran published his observations on the bougie, every surgeon set to work to discover the composition, and each conceived, that he had found it out, from the bougies, which he had made, producing the effects described by Daran. It never occurred to them, that any extraneous body, of the same shape and consistence, would do the same thing.

(*Treatise on the Venereal Disease, p.* 116, *by John Hunter*, 1788.)

Of armed bougies, and of the manner of using bougies in general, we shall speak in the article *Urethra, Strictures of.*

BRAIN. (For concussion, compression of, &c. see *Head, Injuries of;* for the hernia of, see *Hernia Cerebri.*)

BREAST. (See *Mammary Abscess; Mamma, Removal of; Cancer; &c.*)

BRONCHOCELE. (from *βρογχος*, the windpipe, and κηλη, a tumour.) Also called *botium*, or *bocium*. The Swiss call the disease *gotre*. Some have called it, *hernia gutturis, guttur tumidum*, and *trachelophyma, gossum, exechebronchos; gongrona, hernia bronchialis.* Heister thought it should be named *tracheocele*. Prosser, in his late publication on this disorder, from its frequency on the hilly parts of Derbyshire, calls it, with others, the *Derbyshire neck;* and, not satisfied respecting the similitude of this tumour to that observed on the necks of women on the Alps, the *English Bronchocele*.

Modern surgeons constantly mean by *bronchocele*, an enlargement of the thyroid gland. This sometimes attains such a magnitude, that it not only occupies all the space from one angle of the jaw to the other, but also, forms a considerable projection on each side of the neck, advancing forward a good way beyond the chin, and forming an enormous mass, which hangs down over the chest. The swelling, which is more or less unequal, is commonly not particularly hard, especially when the disease is not in a very advanced state; however, no fluctuation is perceptible, and the patients suffer no pain. The skin retains nearly its ordinary colour; but, when the tumour is of very long standing, and great size, the veins of the neck become more or less varicose.

According to Prosser, the tumour generally begins between the eighth and twelfth year. It enlarges slowly during a few years, till, at last, it augments rather rapidly, and forms a bulky pendulous tumour. Women are far more subject to the disease, than men, and the tumour is observed to be particularly apt to increase rapidly during their confinement in childbed. When only one lobe of the thyroid gland is affected, it may extend in front of the carotid artery, and be lifted up by each diastole of this vessel, so as to appear to have the pulsatory motion of an aneurism. (*A. Burn's Surgical Anatomy of the Head and Neck, p.* 195, *and Parisian Chirurgical Journal, Vol.* 2, *p.* 292, 293.)

It is this disease, to which the term *gotre*, or *goitre*, has been particularly applied, and which is so common in some of the valleys of the Alps. Indeed, there are certain places, where the disease is so frequent, that hardly an individual is totally exempt from it. Larrey, in travelling through the valley of Maurienne, noticed, that almost all the inhabitants were affected with goitres, of different sizes, by which tumours, the countenance was deformed, and the features rendered hideous. (*Mémoires de Chirurgie Militaire, Tom.* 1. *p.* 123.) In many, the swelling is so enormous, that it is impossible to conceal it by any sort of clothing. A state of idiotism is another affliction, which is sometimes combined with the *goitre*, in countries, where the latter affection is endemic. However, all, who have the disease, are not idiots, or cretins as they have been called, and in Switzerland, and elsewhere, it is met with in persons who possess the most perfect intellectual faculties. Where bronchocele and cretinism exist together, Foderé, and several other writers ascribe the affection of the mind to the state of the thyroid gland. (See *Essai sur le Goitre et Cretinisme, par M. Foderé.*) This opinion, however, appears to want foundation, since the mental faculties are from birth weak, and, in many, the idiotism is complete, where there is no enlargement of the thyroid gland, or where the tumour is not bigger than a walnut, so that no impediment can exist to the circulation to, or from the brain. (*Burns on the Surgical Anatomy of the Head and Neck, p.* 192.) The direct testimony of Dr. Reeve also proves, that, in the countries, where cretins are numerous, many people of sound and vigorous minds have bronchocele. (See *Dr. Reeves's Paper on Cretinism, Edinb. Med. and Surgical Journal, Vol.* 5, *p.* 31.) Hence, as Mr. A. Burns has remarked, the combination of bronchocele and cretinism must be considered as accidental; a truth, that seems to derive confirmation from the fact, that, in some parts of this country, bronchocele is frequent, where cretinism is seldom or never seen. The bronchocele seems to be endemic in several mountainous countries, particular Switzerland, Savoy, Tyrol, Derbyshire, &c. and it occurs remarkably often in young subjects, and much more frequently in the female, than the male sex. In women, it usually makes its appearance at an early age, generally between the eighth and twelfth year, and it continues to increase gradually for three, four, or five years, and is said sometimes to enlarge more, during the last half year, than for a year, or two, previously. It does not generally rise so high as the ears, as in the cases mentioned by Wiseman, and it is rather in a pendulous form, not unlike, as Albucasis says, the flap, or dewlap of a turkey-cock, the bottom being the largest part of the tumour. It is soft, or rather flabby to the touch, and somewhat moveable, but, after a few years, when it has ceased enlarging, it becomes firmer, and more fixed. When the disease is very large, it generally occasions a difficulty of breathing, which is increased on the patient's catching cold, or attempting to run. In some subjects, the tumour is so large, and affects the breathing so much, that a loud wheezing is occasioned; but, there are many exceptions to this remark. Sometimes, when the swelling is of great size, patients suffer very little inconvenience; while others are greatly incommoded, though the tumour is small. In general, the inconvenience is trivial. The voice is occasionally rendered hoarse. In some instances, only one lobe of the thyroid gland is affected.

The causes of the bronchocele are little known. To the opinion, that bronchocele is caused by the earthy impregnation of water used for drink, the following objections offer themselves. 1. The water of Derbyshire, in districts, where this disease is considered endemic, contains much supercarbonate of lime; but that in common use about Nottingham, where the disease is also prevalent, is impregnated with sulphate of lime. 2. Abstinence from water unboiled does not diminish, nor interrupt the gradual progress of the disease. 3. Patients are cured of the disease, who still continue to drink water from the same source as before, without taking any precaution, as boiling, &c. 4. The disease is seldom found among men. 5. Many instances may be related of a swelling in the neck, sometimes very painful, and generally termed bronchocele, being produced very suddenly, by difficult parturition, violent coughing, or any other unusually powerful effort. (See *Edinb. Med. and Surgical Journal, Vol.* 4, *p.* 279.) The disease is sometimes seen in scrofulous subjects; but, it may be quite independent of the other disorder. On the mountainous parts of Derbyshire, Genoa, and Piedmont, they attribute the bronchocele to drinking water cooled with ice. To this theory, many of the objections, concerning the earthy impregnation of water, stand in full force; with this additional reflection, that, "In Greenland, where snow-water is commonly used, these unsightly protuberances are never met with, nor, (says Watson) did I ever see one of them in Westmoreland, where we have higher mountains, and more snow than they have in Derbyshire, in which county, they are very common. But what puts the matter beyond a doubt, is, that these wens are common in Sumatra, where there is no snow, during any part of the year." (*Watson's Chemical Essays, Vol.* 2, *p.* 157.)

Respecting the influence of particular water in bringing on the disease, Dr. Odier, the well informed professor of medicine, at Geneva, seems to give credit to the opinion, because, it has appeared to him, that distilled water prevented the increase of the tumour, and even tended to lessen its bulk. (See *Manuel de Médecine Pratique.*) However, without denying this power of distilled water, I think the foregoing consideration satisfactorily proves, that the disease neither proceeds from snow water nor water impregnated with particular salts.

An observation lately made by an intelligent writer, would lead one to conclude, that cretinism depends upon malformation of the head. Speaking of goitre, as it appears among the inhabitants of the valley of Maurienne, M. Larrey informs us, that, in many of these people, with this frightful deformity is joined that of the cranium, of which the smallness and excessive thickness are especially remarkable. (*Memoires de Chirurgie Militaire, Tom.* 1, *p.* 123.) Dr. Leake thinks, that tumours of this sort, may be owing to the severity of the cold damp air, as they generally appear in winter, and hardly ever in the warm dry climates of Italy and Portugal. Mr. Prosser is inclined to consider the bronchocele, as a kind of dropsy of the thyroid gland, similar to the dropsy of the ovary, and he mentions, that Dr. Hunter dissected one thyroid gland, which had been consideraby enlarged, and contained many cysts filled with water. These, he erroneously concludes, must have been hydatids. Dr. Baillie remarks, that when a section is made of the thyroid gland, affected with this disease, the part is found to consist of a number of cells, containing a transparent viscid fluid.

The ordinary bronchocele is, in all probability, entirely a local disease, patients usually finding themselves, in other respects, perfectly well. The tumour itself, frequently occasions no particular inconvenience, only deformity. There is no malignancy in the disease, and the swelling is not prone to inflame, or suppurate, though, as Dr. Hunter remarks, abscesses do occasionally form in it. Bronchoceles never become cancerous. Mr. Gooch never knew life to be endangered by this sort of tumour, however large; but, he saw great inconvenience arise from it, when combined with quinsy. Dr. Hunter says, that the bronchocele appears two, or three years before, or after the commencement of menstruation, and that it sometimes spontaneously disappears, when this evacuation goes on in a regular manner. Mr. Prosser thinks, that this change in the constitution hardly ever affects the tumour.

It is a curious fact, that the inhabitants of the valleys of the Alps are particularly liable to bronchocele, while those, who live in higher situations on the mountains, escape the disease.

### TREATMENT OF BRONCHOCELE.

A blister, kept open, has put a stop to the growth of the tumour; but, this method is not much followed at present, as a better plan of treatment has been discovered. The most famous mode of curing the bronchocele is by giving internally burnt sponge, and occasionally, a calomel purge, at the same time, employing frictions to the tumour itself.

The efficacy of burnt sponge is said to be most conspicuous, when this medicine is exhibited in the form of a lozenge, composed of ten grains of this substance, ten of burnt cork, and the same quantity of pumice-stone. These powders are to be made into the proper form with a little syrup, and the lozenge is then to be put under the tongue and allowed to dissolve there. To the latter circumstance, much importance is attached. Other practitioners give a scruple of the burnt sponge alone, thrice every day, while some add a grain of calomel to each dose. A purge of calomel should be ordered about once a week, or fortnight, as long as the patient perseveres in the use of the calcined sponge; but, if mercury be combined with each dose of this medicine, no occasional purgative will be requisite.

External means may very materially assist the above internal remedies. Frequently rubbing the swelling with a dry towel; bathing the part with cold water; rubbing the tumour two, or three times a day, with the aq. ammon. acet. or the camphor liniment; are the best steps of this kind which the surgeon can take.

"In the treatment of bronchocele," says Mr. A. Burns, "repeated topical detraction of blood from the tumour is highly beneficial. Electricity also has sometimes a marked effect; but, there is no remedy, which I would more strongly advise, than regular and long continued friction over the tumour. By perseverance in this plan, a bronchocele, treated in London, was materially reduced in the course of six weeks. Its good effects I have likewise witnessed myself; and it is a remedy highly recommended by Girard in his "*Traité des Loupes.*" It has also been much used in scrofulous tumours by Mr. Grosvenor of Oxford, and by Mr. Russel of Edinburgh." (*Surgical Anatomy of the Head and Neck, p. 204.*)

Mr. A. Burns recommends the friction to be made with flannel, covered with hair powder, and the part to be rubbed, at least, three times a day, for twenty minutes.

In two cases of bronchocele, related by Dr. Clarke, the patients were cured, by "the steady use of the compound plaster of ammoniac and mercury, conjoined with the internal exhibition of the burnt sponge, and occasional purgatives." (See *Edinb. Med. and Surgical Journal, Vol. 4, p.* 280.)

We learn from Professor Odier, that, in Geneva, the bronchocele is cured by burnt sponge, exhibited in powder, or infused in wine, and combined with purgatives to prevent the cramps of the stomach, which sometimes accompany the disappearance of the swelling. Muriate of barytes has likewise been recommended. (See *Manuel de Médecine Pratique.*)

A whole volume might be written on the various remedies, and plans of treatment, of the bronchocele. The limits of this work, however, demand more conciseness, and, having detailed the most approved practice, we shall be very brief on other proposals.

Mr. Wilmer, credulously imputing great influence to the changes of the moon, used to begin with an emetic, the day after the full moon, and to give a purge the day after that. The night following, and seven nights successively, he directed the above-mentioned lozenge to be put under the tongue at bed-time, and administered every noon a bitter stomachic powder. On the eighth day, the purge was to be repeated, and, in the wane of the succeeding moon, the whole process, except the emetic, was renewed. (*Cases in Surgery, Appendix.*) This famous Coventry plan of treatment is said to be greatly assisted, by rubbing the tumour, with an ointment, containing tartar emetic.

Mr. Prosser succeeded with his medicines, though the patient was nearly twenty-five years old, and the swelling had existed more than twelve years. It is said, that no instance of cure has been known, after the patient was twenty-five.

Mr. Prosser orders one of the following powders to be taken early in the morning, an hour, or two after breakfast, and at five, or six o'clock in the evening, every day, for a fortnight, or three weeks. The powder may be taken in a little syrup, or sugar and water, or any thing else, so that none may be lost.

℞ Cinnab. ant. op. levigat. milleped. ppt. et pulv. a a gr, xv. Spong; calcin. ℈ M.

These powders should be taken for two, or three weeks, and left off for a week or nine days, before a repetition. At bed-time, every night, during the second course of the powders, some purgative pills, composed of mercury, the extractum colocynthid. comp. and rhubarb, are to be administered. In general it will be proper to purge the patient with manna, or salts, before beginning with the powders. Mr. Prosser puts no faith in external applications.

Some have recommended giving two scruples of calcined egg shells, every morning, in a glass of red wine; half a dram of the kali sulphuratum, every day, dissolved in water; or ten, or fifteen drops of the *tinct. digit. purpur.* twice a day, the dose to be gradually increased. Muriated barytes; cicuta; and belladonna, have also been exhibited.

Attempts have been made to extirpate the enlarged thyroid gland; but, the numerous large arteries distributed to this part, the dilated state of these vessels, when the gland is much enlarged, and the vicinity of the carotid arteries, render this operation exceedingly dangerous, especially when the swelling is very large, the only instance, in which a patient would submit to this mode of cure. In doing it, one would be obliged to cut arteries large enough to pour forth a vast quantity of blood in a very short time, and so situated, that it would be difficult to tie, or effectually compress them. Mr. Gooch relates two cases, which do not encourage practitioners to have recourse to the excision of enlarged thyroid glands. In one of these instances, so copious an hemorrhage took place, that the surgeon, though equally bold and experienced, was obliged to stop in the middle of the operation. No means availed in entirely suppressing the bleeding, and the patient in a few days died. In the other example, the same event nearly took place, the patient's life only being saved by compressing the wounded vessels with the hand, day and night for a whole week, by persons who relieved each other in turn. The surgeon found this the only way of stopping the hemorrhage, after many fruitless attempts to tie the vessels.

Certainly these cases are well calculated to deter prudent men from undertaking the hazardous operation of cutting out an enlarged thyroid gland. The practice is the less proper for imitation, for, inconvenient as a bronchocele may be, it scarcely ever endangers life.

It must be noticed, however, that a few cases of enormous bronchoceles every now and then occur, which obstruct respiration, deglutition, and the return of the blood from the head, in so serious a degree, that every enterprising surgeon would feel greatly inclined to make any rational attempt to relieve his patient, even though it might be one of a bold description. In such pressing circumstances, a good operator, well acquainted with the anatomy of the neck, would be warranted in attempting the extirpation of the swelling, and he would be most likely to succeed by imitating the plan, which was followed by Desault, and which I shall hereafter particularly relate. (See *Thyroid Gland, Extirpation of.*)

Were a surgeon to be afraid of this attempt, and, were the symptoms urgent, he might adopt another line of conduct, which is, in every respect, rational and warrantable; namely, he might expose, and tie, the superior thyroideal arteries, just as is done in cases of aneurisms. When the quantity of blood, flowing into a tumour, is, suddenly, and, greatly, lessened, the size of the swelling commonly very soon undergoes a considerable diminution. This operation has been actually practised by Sir William Blizard, who tied the arteries of an enlarged thyroid gland, and, in a week, the tumour was reduced one-third in its size. The ligatures then sloughed off; repeated bleeding took place from the arteries, and by the extension of the hospital gangrene, the carotid itself was exposed. The patient died; yet, as Mr. A. Burns maintains, this does not militate against a repetition of the experiment; the same thing might have happened from merely opening a vein, and, in the confined air of an hospital, has actually happened. (*Surgical Anatomy of the Head and Neck, p.* 202.) For my own part, I am decidedly of opinion, that the great decrease in the size of the gland before death, is a sufficient encouragement to repeat the trial, particularly, as the mode of tying arteries is now brought to the greatest perfection. If the femoral, the axillary, the carotid, and even the external iliac, arteries will heal, when tied on the best and most scientific principles, there can be no doubt, that the superior thyroideal is capable of doing so.

Recent bronchoceles may often be cured by proper medicines and applications; but when inveterate, though they may generally be diminished, they can hardly ever be entirely removed.

Petit, Heister, and Schmucker, however, have made mention of inveterate bronchoceles, which got well gradually of themselves without much inconvenience, in consequence of the tumours suppurating. Volpi has likewise recently confirmed, that such ulcerations are not unfrequent. He has published two facts of this kind, which occurred after a nervous fever; and he records a third case, where the swelling inflamed in consequence of a blow of the fist, and suppurated and sloughed, so as entirely to disappear. (See *Léveille Nouvelle Doctrine Chirurgicale, T. 4, p.* 128.)

It is somewhat extraordinary, that, notwithstanding there are so many recorded instances of the bronchocele being cured, Richerand, in his late work, should have set down the disease as totally incurable, either by external applications, or internal medicines. (See his *Nosographie Chirurgicale, Tom. 4, p.* 167. *Edit.* 4.)

Albucasis gave the first good account of the bronchocele His remarks are translated in Friend's Hist of Physic, and James's Med. Dic. (See also *Turner's Surgery, Vol.* 1, *p.* 164. *Wilmer's Cases and Remarks in Surgery. Prosser on Bronchocele, Edit.* 3. *Bell's Surgery, Vol.* 5. *White's Surgery. Memoirs of the Med. Society of London,* 217. *Gooch's Chirurgical Works, Vol.* 2, *p.* 96.—*Vol.* 3, *p.* 157. *Desault's Parisian Chirurgical Journal, Vol.* 2, *p.* 292. *Œuvres Chirurgicales de Desault, par Bichat, Tom.* 2, *p.* 298. *Edinb. Med. and Surgical Journal, Vol.* 4, *p.* 279. *Odier's Manuel de Médecine Pratique. Dr. Reeves's Paper on Cretinism, in Edinb. Med. and Surgical Journal, Vol.* 5. *Essai sur le Goître et Cretinisme, par M. Foderé. Richter's Anfangsgrunde der Wundarzneykunst, Band.* 4. *Zweyter Auflage, Kap.* 13, *Vom Kropfe. Surgical Anatomy of the Head and Neck, by A. Burns, p.* 191, *&c. Larrey, Memoires de Chirurgie Militaire, Tom.* 1, *p.* 123. *Tom.* 3, *p.* 199, *&c. Léveille's Nouvelle Doctrine Chirurgicale, T.* 4, *p.* 125, *&c Lassus, Pathologie Chirurg. T.* 1, *p.* 408, *&c. Petit, Œuvres Posthumes, T.* 1, *p.* 255. *Haller, Opuscula Pathologica, Obs.* 5, *p.* 16.)

BRONCHOTOMY. (from βρογχος, the windpipe, and τεμνω, to cut.) This is an operation, by which an opening is made into the larynx, or trachea, either for the purpose of making a passage for the air into, and out of, the lungs, when any disease prevents the patient from breathing through the mouth and nostrils; or of extracting foreign bodies, which have accidentally fallen into the trachea; or, lastly, in order to be able to inflate the lungs in cases of sudden suffocation, drowning, &c.

The operation is also named *tracheotomy*, or *laryngotomy*. Its practicableness, and little danger, are founded on the facility, with which certain wounds of the windpipe, even of the most complicated kind, have been healed, without leaving any ill effects whatever, and on the nature of the parts cut, which are not furnished with any vessel of consequence.

This operation is proper in several cases, and requires being differently practised, according to a variety of circumstances. It is not at all a dangerous proceeding, *dummodo*, (says Fabricius ab Aquapendente) *qui secat sit anatomes peritus, quia sub hoc medico et artifice, omnia tutissimè et felicissimè peraguntur.*

1. Bronchotomy, we have said, is occasionally performed, to enable the patient to breathe, when respiration through the mouth and nostrils is impeded by disease.

Quinsy is an affection sometimes creating a necessity for the operation; but, of all those cases, which Boerhaave has described, and of which his learned commentator has said so much, there is only that, which is named *strangulans*, for which bronchotomy is indispensable. This species of quinsy presents no visible symptom, either in the throat, or the pharynx. The examination of the dead subject proves, that the disease is situated in the edges of the rima glottidis, which opening becomes so contracted as scarcely to leave the smallest space. For this reason, and on account of the tension of the ligaments of the glottis, the voice is rendered excessively acute, and hissing as it were. The suffocation is imminent; the lungs not being expanded, the blood accumulates, in these organs, and there is an impediment to the return of the blood from the head through the jugular veins. Hence, a plethoric state of the brain is occasioned. Considering all these circumstances, some have inferred, that many of the patients, who have thus perished, might have been saved by making a timely opening into the trachea. All writers, who have treated of bronchotomy in cases of quinsy, have invariably regarded this operation as the ultimate resource. Both the Greeks and Arabians were of this sentiment. In such cases, Avicenna only recommends bronchotomy in violent quinsies, when medicines have failed, and the patient must evidently die from the unrelieved state of the affection. Rhases also advised the operation only when the patient was threatened with death. Thus we see, that bronchotomy, which might be proper in regard to the object intended, became hurtful from the way, in which it was executed.

It was doubtless in consequence of the ill-success of the operation, that Paulus Ægineta observed: *In synanchicis quidem chirurgiam improbamus, cùm inutilis sit præcisio.* Bronchotomy, says M. Louis, will always be done too late, when only allowed as an extreme measure. The danger of perishing by suffocation, in cases of quinsy, M. Louis remarks, has been known from the very dawn of medicine. The advice of Hippocrates, to remedy this urgent symptom, is a proof of it, and, he observes, that the danger is evinced when the eyes are affected and prominent, as in persons who have been strangled, when the face, the throat, and neck burn, without any thing appearing to be wrong on inspection. He recommends *fistulæ in fauces ad maxillas intrudendæ, quò spiritus in pulmonem trahatur.* No doubt, he would have advised more, had it not been for the doctrine of his time, that the wounds of cartilages were incurable.

This method, defective as it was, continued to be the practice, till the time of Asclepiades, who, according to the statement of Galen, was the first proposer of bronchotomy. Since Asclepiades, this operation has always been recommended, and practised in cases of quinsy, threatening suffocation, notwithstanding the inculcation of Cælius Aurelianus, who treated it as fabulous. The mode of doing it, however, has not been well detailed by any who put it in practice, except Paulus Ægineta, who is very precise and clear. "We must (says he) make the incision in the trachea, under the larynx, about the third or fourth ring. This situation is the most eligible, because it is not covered with any muscle, and no vessels are near it. The patient's head must be kept backward, in order that the trachea may project more forward. A transverse cut is to be made between two of the rings, so as not to wound the cartilage, only the membrane." The knowledge of this method, and its advantages in cases of the *angina strangulans*, when practised in time, ought, according to M. Louis, to have rendered its performance a general practice.

The convulsive angina of Boerhaave, which particularly affects those, who can only breathe well in an upright posture, has also been adduced as a case demanding the prompt performance of bronchotomy. Mead, in his *Præcepta et Monita Medica*, relates a case. The patient had been bled very copiously twice in the space of six hours, but he died notwithstanding this large evacuation. The same author took notice in Wales, especially, on the sea-coast, of an epidemic catarrhal quinsy, which carried the patients off in two or three days. In these instances, bleeding was not of much use, and bronchotomy, which was not performed, was the only means by which the patients might have been saved.

The practitioners of the present day are generally less sanguine in their expectation of benefit, in cases of angina and croup, than M. Louis was. From the observations of Dr. Cheyne, it would appear, that, in croup, the operation cannot be necessary for the purpose of admitting air into the trachea; for, in those, who have died of the disease, he has found a pervious canal, of two-eighths of an inch in diameter, and through a tube of such diameter, even an adult can support respiration for a considerable time. According to the same writer, bronchotomy is equally unfitted for the removal of the membrane formed by the effusion of lymph; for, from its extent, variable tenacity, and adhesions, this is, in almost every case, totally impracticable; and even could the whole membrane be removed, still the function of respiration would be but little improved, the ramifications of the trachea and bronchial cells remaining obstructed. (See *Cheyne's Pathology of the Larynx and Bronchia*.)

M. Pelletan joins the best modern writers, in representing bronchotomy, as generally useless in cases of croup: the only example, in which he thinks the operation might be serviceable, is where the disease is confined to the larynx, a case, which seems to be very uncommon, and difficult to distinguish. "*En supposant enfin l'angine avec concrétion bien caractérisée, on se trouvera encore entre la crainte de pratiquer une opération inutile, si les concrétions se prolongent jusque dans les bronches, et l'impossibilité de juger si ces concrétions sont bornées au larynx. C'est en effet dans ce seul cas que l'opération peut être fructueuse; elle facilitera la respiration pendant que la nature, aidée de l'art, travaillera à dissoudre, détacher, et faire expectorer les fausses membranes qui obliterent la glotte et le larynx.* (*Clinique Chirurgicale, Tom.* 1, *p.* 28.)

Dr. Baillie has recently published three cases, in which death was produced in the adult subject, and, in a very few days, by a violent inflammation of the larynx and trachea. The disease had a strong resemblance to croup; but, yet was different from it. There was not the same kind of ringing sound of the voice as in croup, and no layer of coagulable lymph was formed upon the surface of the inner membrane of the larynx and trachea, which, according to Dr. Baillie, uniformly attends the latter disease. In one of these cases, the cavity of the glottis was found to be almost obliterated, by the thickening of the inner membrane of the larynx at that part. The inner membrane of the trachea was likewise inflamed; but, in a less degree. The lungs were sound. If, in thirty hours, no relief should be derived from bleeding ad deliquium, and the exhibition of opiates, Dr. Baillie conceives, that, in this sort of case, it might be advisable to perform the operation of bronchotomy at the upper part of the trachea, just under the thyroid gland. This operation, he thinks, would probably enable the patient to breathe, till the inflammation in the larynx, more especially, at the aperture of the glottis, had time to subside. (See *Transactions of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol.* 3, *p.* 275—289.)

An acute affection of the membrane of the glottis, proceeding rapidly to a fatal termination by suffocation, has also been lately particularly described by Drs. Farre and Percival. (See *Medico-Chirurgical Trans. Vols.* 3 and 4.) In some bodies, which Mr. Lawrence has examined after death, he has found appearances analogous to those mentioned by the above physicians. "The patients died of suffocation: but the progress of the complaint was much slower, than in those cases; the symptoms were not acute, nor did the inspection of the parts disclose any evidences of active inflammation. The membrane, covering the chordæ vocales was thickened, so as to close the glottis, and a similar thickening extended to a small distance from these parts, accompanied with an œdematous effusion into the cellular substance under the membrane. The epiglottis did not partake of the disorder. In one or two instances, this thickened state of the membrane was the only change of structure observed; but in others it was attended either with ulceration of the surface near the glottis, appearing as if it had been formed by an abscess, which had burst; or with a partial death of one or more of the cartilages of the larynx, viz. the arytenoid, thyroid, or cricoid. The rest of the air passages and the lungs were healthy." (*Medico-Chirurg. Trans. Vol.* 6, *P.* 222.)

In such examples, this gentleman is a zealous advocate for the early performance of bronchotomy, and he has cited several instances, in which this operation was successfully performed both for the relief of quinsy and extraction of foreign bodies from the trachea.

The compression of the trachea by foreign bodies, lodged in the pharynx, or by tumours, formed outwardly, and of sufficient size to compress the windpipe, is an equal reason for operating, more or less expeditiously, according to the symptoms. Mr. B. Bell mentions two instances of suffocation from bodies falling into the pharynx. Respiration was only stopped for a few minutes; but, the cases were equally fatal, notwithstanding the employment of all the usual means. This author thinks, there was every reason to believe, that bronchotomy would have been attended with the greatest success, if it had been performed in time, before the effects of the suffocation had become mortal. The operation should also be done, when the trachea is compressed by tumours. The author of the article *Bronchotomie*, in *l'Encyclopédie Méthodique,* says, that about twenty years ago, he opened a man, who had died of an emphysema, which came on instantaneously. He had had, for a long while, a bronchocele, which was of an enormous magnitude towards the end of his life. The cavity of the trachea was so obliterated, that there was scarcely room enough to admit the thickness of a small piece of money. Doubtless, bronchotomy, performed before the emphysema made its appearance, would have prolonged this man's days.

In cases of this last description, Desault would have advised the introduction of an elastic gum catheter into the trachea from the nose, in order to facilitate respiration. This practice, I believe, has not hitherto been attempted by English surgeons, though it has been repeatedly tried in France. (See *Œuvres Chirurgicales de Desault par Bichat, Tom.* 2, *p.* 236, &c.)

M. Habicot, in a treatise, intitled, *Question Chirurgicale sur la Possibilité et la Necessité de la Bronchotomie,* mentions his having successfully performed this operation on a lad fourteen years old, who, having heard it said, that gold, when swallowed, did no harm, attempted to swallow nine pistoles, wrapped up in a piece of cloth, to hide them from thieves. The packet, which was very large, could not pass the narrow part of the pharynx; and here it lodged, so that it could neither be extracted, nor forced down into the stomach. The boy was on the point of being suffocated by the pressure, which the foreign body made on the trachea; and his neck and face were so swollen and black, that he could not have been known. M. Habicot, to whose house the patient was brought, attempted in vain, by different means, to dislodge the foreign body. At length, perceiving the patient in evident danger of being suffocated, he resolved to perform bronchotomy. This operation was no sooner done, than the swelling and lividity of the face and neck disappeared. M. Habicot pushed the pieces of gold down into the stomach with a leaden probe, and the pistoles were, at different times, discharged from the anus, eight or ten days afterwards. The wound of the trachea very soon got quite well. (See *Mem. de l'Acad. de Chirurgie, Tom.* 12, *p.* 243. *Edit. in* 12*mo.*)

In such a case, Desault would have introduced an elastic gum catheter into the larynx, instead of performing bronchotomy, which could not answer, were the foreign body low down. (See *Œuvres Chirurg. de Desault, Tom.* 2, *p.* 247.)

2. We have said, that foreign bodies in the trachea, may render it necessary to practise bronchotomy. M. Louis, in an excellent memoir, on extraneous substances in the trachea, has proved, more convincingly than all other preceding writers, the necessity of the operation in circumstances of this kind. The proofs are adduced in a case, which fell under his own observation, and which we shall quote.

On Monday, the 19th of March, 1759, a little girl, seven years old, playing with some dried kidney-beans, threw one into her mouth, and thought she had swallowed it. She was immediately attacked with a difficulty of breathing, and with a convulsive cough, which was very afflicting. The little girl said, she had swallowed a bean, and such assistance as was thought proper, was given her. Want of success was the cause of several surgeons being successively sent for, who vainly employed the different means, prescribed by art, for extracting foreign bodies from the œsophagus, or forcing them into the stomach. A fine sponge, cautiously fastened to the end of a whalebone probang, was repeatedly introduced through the whole extent of the œsophagus. The little girl, who made a sign with her finger, that the foreign body was situated in the middle of the neck, thought that she felt some relief, when the sponge was conveyed below the place which she pointed out. She had, every now and then, a violent cough, the efforts attending which produced convulsions in all her limbs. Deglutition was unobstructed; and warm water and oil of sweet almonds had been swallowed without difficulty. Two whole days had passed in sufferings, when the relations called M. Louis to render his assistance. The little girl, with all possible fortitude and sense, was several times held in her friend's arms, ready to die of suffocation. M. Louis, well aware of what had happened, came into the room, where the patient was. She was sitting up in her bed, suffering no other symptom, than a very great difficulty of breathing. M. Louis enquired where she felt pain, and she made such a sign in reply, as left no doubt concerning the nature of the accident. She put the index finger of her left hand on the trachea, between the larynx and sternum. The fruitless attempts which had been made in the œsophagus, with a view of dislodging the foreign body; the nature and the smallness of this body, which was not such as would be stopped in the passage for the food; and the facility of swallowing, were negative proofs that the bean was not in the œsophagus. Respiration was the only function disturbed; it was attended with difficulty, and a rattling in the throat. The little girl expectorated a frothy fluid, and she pointed out so accurately the painful point where the object producing all her sufferings was situated, that M. Louis did not hesitate to declare to the relations, from this single inspection, that the bean was in the windpipe, and that there was only one way of saving the child's life, which was to make an incision, for the purpose of extracting the foreign body. He apprised them that the operation was neither difficult nor dangerous, that it had succeeded as often as it had been practised, and that the very pressing danger of the case only just allowed time to take the opinion of some other well-informed surgeons, respecting the indispensable necessity for such an operation. M. Louis thought this precaution necessary, in order to acquire the confidence of the parents, and to shelter himself from all reproach, in case the event of the case should not correspond with his hopes. M. Louis went home to prepare all the requisites for bronchotomy, and, in two hours, he was informed the surgeons, who were consulted, waited for him. Since M. Louis went away, the child had become quiet, and was lying on its side asleep. The opinion he had delivered, had been ill-explained by the friends and attendants, and had been discussed, before his return. They, who had been rendering their assistance, on the supposition, that the foreign body was in the œsophagus, evinced surprise at the proposal of extracting, by an operation, a substance, the presence of which, in any part of this tube, was not obvious. M. Louis explained his advice, in regard to bronchotomy, and he did not expect a doubt to be set up against so positive a fact. The investigation of truth may authorize objections, to which those who make them, only give the value which is due; but M. Louis was asked concerning the possibility of the case. It was objected, that a substance as large as a bean could not insinuate itself into the trachea. He brought every one into his sentiment, by a short explanation of cases of this sort, with which he was himself acquainted. The little girl was examined, she was better, than when M. Louis saw her before, and a very palpable emphysema was seen above the clavicle, on each side of the neck, a symptom which did not exist two hours previously. This swelling made M. Louis conclude, that the urgency for the operation was still greater. The friends, whose confidence had been shaken by the opposition he had experienced in bringing about unanimity, were in the greatest embarrassment, when they were told, that the child might die of an operation, which he had represented as only a simple incision, free from all danger. M. Louis was repeatedly asked, if he would be responsible for the child's life during the operation, and he in vain replied, that if there were any thing to fear during the operation, it would be from the accident itself, and not from the assistance rendered. This distinction was not perceived, and M. Louis withdrew, at the same time refusing his consent to the exhibition of two grains of emetic tartar, the effect of which would be useless, and might be dangerous. The medicine was given in the night: the child was fatigued with its operation, and quite unbenefited. On Tuesday morning, M. Louis found the little girl very quiet, and they who had paid their visits before him, found her wonderfully well. The respiration, however, continued to be still attended with a rattling noise, which M. Louis had observed in the evening, when the breathing was much more laborious. The child was nearly suffocated several times in the course of the day, and died in the evening, three days after the accident.

M. Bordenave, who had seen the patient, informed M. Louis of the child's death on Friday. The body was opened, before a numerous assembly of persons. After making a longitudinal incision through the skin and fat, along the trachea, between the sterno-hyoidei muscles, M. Bordenave slit open the trachea, cutting three of its cartilages. This very instant, every one could see the bean, and M. Louis took it out with a small pair of forceps. It was manifest, from the ease, with which this foreign body was extracted, that the operation would have had, on the living subject, the most salutary effect. The relations had to regret having sacrificed a child, which was dear to them, to an irresolution and a timidity, which the most persuasive arguments could not remove. (*Mem. de l'Acad. Royale de Chirurgie, Tom.* 12, *p.* 293, *&c. Edit. in* 12*mo.*)

This case evinces, in the most decided manner, the symptoms, which result from the presence of foreign bodies in the trachea, and shews the only one surgical proceeding, which can be of use. But, among the phenomena, apparently difficult of explanation, is the calm, which, at different intervals, followed the afflicting cough. Anatomy, however, has dispelled much of the doubt on this matter. It is known, that the whole canal of the trachea is much less sensible, than the rima glottidis. A foreign body, like a bean, may remain a certain time in that canal without much inconvenience, the passage being only somewhat obstructed, according to the position of the substance. It may even remain several days, months, or years, without producing any symptom of its presence, except a trivial sensation of obstruction, and this is what happens, when the body lodges in one of the ventricles of the larynx. Facts of this kind are to be found in Tulpius, Bartholine, and many other observers. But, when the extraneous substance quits its situation, and is carried into the trachea, the irritation, which it produces there, and, particularly, about the larynx, occasions coughing, and if, in the fits, the foreign body should become fixed between the lips of the glottis, it may cause instantaneous death, as probably has happened in many of the cases of suffocation from extraneous substances.

Another remarkable circumstance which deserves more attention, as it confirms the presence of a foreign body in the trachea, is the emphysema, which appeared about the clavicle, towards the termination of the case. M. Louis did not believe, that any of the persons, who saw the patient, could entertain a just idea of the origin of this symptom. It might be imagined, that the obstruction, which the foreign body caused, for two days, to the free passage of the air, might have occasioned a forcible distention of the trachea, and a rupture of the membranes, which connect together the cartilaginous rings of this tube; but this error was dispelled by the examination after death. The windy tumour had not originated in the circumference of the trachea; here its limits were only seen. The very substance of the lungs, and the mediastinum, were emphysematous. The air, which was confined by the foreign body, must have ruptured the air-cells, during the violent fits of coughing, and thus insinuated itself into the interlobular cellular substance of the lungs. Thence the air must have passed into the cellular substance of the lungs. Thence it must have passed into the cellular substance connecting the pleura pulmonalis with the outer surface of these organs, and by the communication of the cells with each other, it produced a prodigious swelling of the cellular substance, separating the two layers of the mediastinum. The emphysema, in its progress, at length made its appearance above the clavicles. The swelling of the lungs, and the circumjacent parts, in consequence of the insinuation of air into the cellular substance, is a manifest cause of suffocation. The tumefaction appears to be so natural an effect of the presence of a foreign body in the trachea, that one can hardly believe it is not an essential symptom, though before M. Louis, no author made mention of it.

Foreign bodies in the trachea, however, do not always cause death so suddenly, which may be owing to their smallness, their smoothness, or the situation in which they are fixed. An example is related in *les Ephémérides des Curieux de la Nature, Decad. 2. Ann.* 10. As a monk was swallowing a cherry, precipitately, the stone of the fruit passed into the trachea. A violent cough, and excessive efforts, as it were, to vomit, were the first symptoms of the accident, and of these the patient thought he should have died. A sleep of some hours followed this terrible agitation, and the patient afterwards did not feel the least inconvenience during a whole year. At the end of this time, he was attacked by a cough, attended with fever. These symptoms became worse and worse, every day. At length the patient evacuated a stone as large as a nutmeg. It was externally composed of tartareous matter, to which the cherry-stone had served as a nucleus. A copious purulent expectoration followed the discharge of the foreign body, and the patient died consumptive some time afterwards. No mention is made of the body being opened; but, from the symptoms, there is every reason to believe, that an abscess must have arisen in the substance of the lungs, from the presence of the foreign body. That foreign bodies in the trachea, even when they do not induce pressing symptoms of suffocation, may ultimately kill the patient by inducing disease of the lungs, is proved by several cases on record, and, particularly by one, which occurred to Desault; a cherry-stone was lodged in one of the ventricles of the larynx; the patient would not consent to an operation, and died after two years *d'une phthisie laryngée.* (See *Œuvres Chir. de Desault, Tom.* 2, *p.* 258.)

Some valuable observations, confirming the necessity of an early recourse to bronchotomy, in cases, where foreign bodies are lodged in the trachea, have been published by M. Pelletan, now one of the surgeons of the Hôtel-Dieu, and a practitioner of vast experience. In one case, in which a bean had fallen into a child's trachea, and in which the most urgent symptoms of suffocation had prevailed for four days, and convulsions during the last thirty-six hours of this space of time, M. Pelletan performed the operation, which a timid practitioner, under whose management the young patient was first placed, had neglected to do at an earlier period. Upon the incision being made into the trachea, the bean was immediately thrown out to the distance of two feet, and the child for a time was relieved. The little boy was so extremely weak, that it was at one time supposed he was dead. However, with the assistance rendered to him, he gradually revived, even regained his senses, called his parents, and asked for such things as he wanted.

This hopeful state lasted eight or ten hours, after which, convulsions came on again, and the child died fourteen hours after the operation.

Notwithstanding the turgid appearance of all the blood-vessels of the brain, as detected after death, the little boy had yet received a degree of relief at the instant of the foreign body being extracted. M. Pelletan deems it unnecessary to insist on the great probability of success, that would have attended the operation, had it been performed at an earlier period.

Of such success, M. Pelletan gives us the following example.

In the month of May, 1798, a child, about three years old, was brought to the Hôtel-Dieu, who, in playing with some French beans, and putting them into its mouth, let one of them slip into the trachea. For three days, the child was afflicted with a continual cough, and sometimes the symptoms of suffocation were most pressing. This time had been spent in administering emetics, introducing instruments into the œsophagus with the design of forcing the foreign body into the stomach, and in inspiring the relation, with a pernicious confidence, arising from the very long intervals of repose, which the child experienced, during which, however, a rattling in the throat continued, a characteristic mark of the accident. Pelletan immediately decided to perform the operation. The child was very fat, and this circumstance, together with the small diameter of the trachea at this age, rendered the exposure of the anterior portion of this tube difficult. Pelletan was at this moment struck with the reflection, that bronchotomy should never be attempted except by men of science, coolness, and experience in operations. The rings of the trachea, however, were at length cut, and there was no sensible interval, between the incision and the expulsion of the foreign body. The bean had swelled considerably with the moisture. The child seemed restored to life; it spoke freely; it was only troubled with coughing, the effect of a small quantity of blood insinuating itself into the trachea, which fluid was instantly rejected again. This event has the appearance of convulsions, and may alarm those, who do not understand it; but, according to Pelletan, it is the guarantee of the patient's life by expelling, incessantly, and without difficulty, whatever happens to get into the trachea. The wound was healed in twenty days, and the child's voice was not perceptibly altered.

In another interesting case, recorded by the same writer, a pebble was lodged in the windpipe, and the case, not being understood, was treated, for about three weeks, as a simple inflammation of the lungs. At last, bronchotomy was performed, and, by placing the child in a horizontal position, the stone was soon discharged through the incision. The patient was immediately relieved; but, the effects of the inflammation of the lungs, and injury which these organs had sustained, could never be entirely cured, and the child died phthisical eight months afterwards.

M. Pelletan details, other cases, in which the foreign body, being fixed in the trachea, could not be forced out by the breath, as soon as the incision was made, but, required further means to disengage it. In one instance, Pelletan made a long cut in the windpipe of a child; but, nothing made its appearance. A probe, wrapped round with some oiled linen, was then introduced several times up and down the larynx, without creating a great deal of uneasiness, and the child continued to respire very well through the opening in the trachea. The foreign substance was presently brought to the wound and extracted: it proved to be part of the jaw of a mackarel, with many sharp teeth in it. This child soon experienced a perfect recovery.

In another instance, a young man came to the Hôtel-Dieu, in consequence of being afflicted, for six weeks, with a severe cough, frequently accompanied with a sense of suffocation. These complaints, on enquiry, were ascertained to arise from a button mould having fallen into the trachea. An opening was, therefore, made in this tube; but, though the button could be felt, it could not be extracted with the finger. The cricoid cartilage was now divided, and the foreign body was then taken out of the left ventricle of the larynx. The man recovered.

In one case, related by Pelletan, a piece of tendon of veal, got down the glottis, and gave rise to most dangerous symptoms. The foreign body was described as being so large, that this surgeon could not but suppose, that the complaints were owing to its lodgment in the œsophagus, as it seemed to be incapable of entering the glottis. The introduction of instruments down the pharynx, however, produced no relief; but, on dividing the thyroid cartilage, Pelletan passed his finger within the larynx, and, without knowing it, pushed the piece of tendon towards the glottis, when, with the aid of a probang, it was forced into the pharynx and swallowed. The patient experienced immediate relief, and got quite well. (See *Pelletan's Clinique Chirurgicale, Tom.* 1.)

With respect to bronchotomy, for cases, in which extraneous substances are supposed to be lodged in the trachea, one important caution seems necessary, viz. whenever the foreign body is above a certain size, a probang should always be passed down the œsophagus before cutting into the windpipe; for, very similar symptoms to those, which proceed from extraneous substances in the trachea, may be caused by the lodgment of foreign bodies in the œsophagus. In fact, bronchotomy has actually been performed, while the extraneous substance was in the œsophagus, from which last situation no attempt was made to displace it, and the patient lost his life. (See *Œuvres Chirurgicales de Desault, Tom. 2, p.* 261.)

Bronchotomy has been proposed in cases, in which the tongue is so enlarged, as totally to shut up the passage through the fauces. Richter mentions an inflammation of the tongue, in which this part became four times larger than in the natural state. Valescus had made the same observation: *Ego aliquando vidi ità magnificatam, linguam propter humores, ad ejus substantiam venientes, et ipsam imbibentes quod quasi totum os replebat, et aliquando ex ore exibat. Lib. 2, cap.* 66. Such prodigious swellings of the tongue are said sometimes to occur in malignant fevers, and the small-pox. They are also sometimes quite accidental, as, for instance, the cases which happen from the stings of insects, or the unskilful employment of mercury. Mr. B. Bell gives an example of the latter sort. He says, that the patient had taken, in a very short time, so large a quantity of mercury, that the part became alarmingly swollen in a few hours, and, though all the usual remedies were tried, none had the least effect. Bronchotomy was delayed till the patient was nearly suffocated; but he was restored as soon as an opening was made in the trachea. Some have objected to this practice, alleging, that scarifying the tongue will bring relief in time. (*Encyclopédie Méthodique; Partie Chirurgicale, Art. Bronchotomie.*) M. Malle's observations on the swelling of the tongue, and the most effectual means of relieving it, seem to confirm the latter sentiment.—(*Mém. de l'Acad. de Chirurgie, Tom.* 14, *p.* 408, *&c. Edit. in* 12*mo.*)

In cases of the preceding description, Desault would have advised the introduction of an elastic gum catheter, from the nose into the trachea, in order to enable the patient to breathe, until the swelling of the tongue had subsided. (See *Œuvres Chirurgicales de Desault par Bichat, Tom.* 2, *p.* 246.)

Bronchotomy has been proposed, when both the tonsils are so enlarged that they quite impede respiration. Here, the inflammatory swelling is not meant; this commonly soon suppurates, and the spontaneous bursting of the tumour, or the opening of it with a pharyngotomus, always does away the necessity for so extreme a measure. It is the chronic enlargement now alluded to, that case mentioned in the article *Tonsils*, and which sometimes acquires an immense size. From our remarks on the disease, it will be seen, that more is to be expected from the excision of the tonsils, than from the operation now in question. Besides, before the glands are so large as to threaten suffocation, they should be cut away, in preference to performing bronchotomy, which would relieve the urgency, but not the cause. In general, there is no urgent danger of suffocation, till the swelling is such as not only to shut up the posterior aperture of the mouth, but also the posterior openings of the nostrils, which is exceedingly rare. In cases of obstructed respiration from enlargement of the tonsils, Desault preferred the introduction of the elastic catheter, from the nose into the larynx, to the operation of bronchotomy. It is not common for a polypus to make this operation necessary. Boerhaave, however, mentions a case, in which the patient was suffocated, as the surgeon was going to extirpate a tumour of this kind: no doubt, this patient might have been saved, if bronchotomy had been previously performed. Polypi, growing in the larynx itself, are very rare; but, examples are recorded; and, if such tumours happen to obstruct the glottis, the patients are instantly suffocated. Some instances of this kind are related by Bichat. The only mode of getting at such swellings, so as to extirpate them, is by performing bronchotomy. (See *Œuvres Chirurg. de Desault par Bichat, Tom.* 2, *p.* 254, 255.)

Lastly, bronchotomy has been recommended to be done on persons recently suffocated or drowned. Detharding is the first author, who has treated of the necessity of this operation, in the latter case, in a letter addressed to Schroeck, intitled, *De Methodo subveniendi submersis per laryngotomiam. Hactenus rectè*, says Haller, *si spuma quâ pulmo in submersis offercitur eâ administratione repelli quiret.* This writer maintains, that drowned persons have no water in their chests, or air-vessels of the lungs, and that they perish suffocated, for want of air and respiration, and that, while the person is under water, the epiglottis applies itself so closely over the glottis, that not one drop of water can pass. But, these assertions are quite contrary to the numerous experiments made by M. Louis, who drowned animals in coloured fluids, and proved that they who are drowned, inspire water, with which the air-vessels and cells are quite filled. M. Louis has also opened men, who have perished under water, but, in them, he never found the epiglottis applied to the glottis, as Detharding says it is; indeed, anatomy proves the impossibility of its being so. Detharding's theories were wrong, and, as he did not use any power to distend the lungs with air, his mere practice of bronchotomy must have been useless. When there is a free communication between the cells of the lungs and the atmosphere, the air will not expand these organs, if the inspiratory muscles can no longer act. Hence, after opening the trachea, and letting as much water run out of this tube as possible, the pipe of a pair of bellows should be introduced, and the air forcibly introduced into the lungs.

Detharding's opinion, that drowning is a species of suffocation, was right, and that the privation of oxygen gas is the cause of death. Hence, we see the propriety of introducing this air into the lungs, as speedily as possible, whenever we think, that animation has not been so long suspended, that every hope of restoration is over. Indeed, it is proper to distend the lungs with air, in all cases in which animation has been recently suspended by suffocation, immersion under water, or by noxious vapours and gases. This measure is highly proper, in conjunction with electricity, the communication of warmth to the body, the application of strong volatiles to the nostrils, rubbing the body with warm flannels, and the injection of any fluid, like warm wine and water, into the stomach, through a hollow bougie. Tobacco clysters, which even have had the sanction of the Royal Humane Society, should, however, be reprobated, as the qualities of this plant are peculiarly destructive of the vital principle, and not simply stimulating. I am sorry to find this last means commended by so respectable a surgeon as M. Larrey, who joins the rest of the French surgeons in condemning electricity and bronchotomy. He speaks in favour of opening the jugular vein, exposing the body to the fire, friction, &c. On dissecting the bodies of some drowned persons, M. Larrey found, as M. Louis had done long since, that the air-tubes of the lungs were filled with water, instead of air, and that the epiglottis was raised and applied to the os hyoides. (See *Mémoires de Chirurgie Militaire, Tom.* 1, *p.* 83—85.)

There are many modern practitioners, who consider bronchotomy, as needless in cases of suspended animation, because, it is contended, that, as the patient is always destitute of sensation, a tube may easily be passed into the trachea from the nose or mouth, for the purpose of inflating the lungs. Either the curved pipe of a pair of bellows may be introduced into the glottis through the mouth, or an elastic gum catheter may be passed into the trachea from the nose. "*On peut mettre ce moyen à exécution (says Pelletan) chez les asphixiés, ou les enfans nouveaux nes, qui ne respirent pas; parsque, dans ces differens cas, non seulement il n'y a pas d'inflammation, mais même toute sensibilite est suspendue, et la canule est commode pour souffler de l'air dans les poumons, en même temps qu'elle peut causer une irritation salutaire. M. Baudelocque, mon célèbre confrère m'a temoigné se servir habituellement, et avec succès de ce moyen pour appeler à la vie les nouveaux nés dont la respiration ne s'établit pas.*" (*Clinique Chirurgicale, Tom.* 1. *p.* 29.)

Desault likewise conceived, that the lungs might be easily inflated, without performing bronchotomy. (*Œuvres Chir. Tom.* 2, *p.* 239.)

Mr. A. Burns adopts the same sentiment. (*Surgical Anatomy of the Head and Neck, p.* 384.)

My own individual opinion upon this subject is, that, if a surgeon knows, that he can inflate the lungs as completely and expeditiously, without performing bronchotomy, as he could by making an incision in the trachea, he is right in dispensing with the latter operation. But, in the generality of cases of suspended animation, (that of new-born infants excepted) where bronchotomy would be an objectionable undertaking, I much doubt, whether in actual practice bronchotomy will not be found the best and most speedy means of enabling the surgeon to distend the lungs with air. If you follow Desault's suggestion, I contend, that you are likely to be some minutes longer in getting the elastic catheter from the right nostril into the larynx, than you would be in cutting into the trachea, and introducing into the incision the muzzle of a pair of bellows. Supposing the elastic catheter introduced, will you now be able to distend the lungs with air, in an adequate degree, an object of the highest moment? A pair of bellows seems to me almost essential to this purpose. I shall say nothing on the probability of many practitioners coming to the patient unprovided with the requisite sort of tube.

If a pair of bellows, with a curved pipe, be employed, many surgeons would be a considerable time in getting the muzzle into the glottis, and, in the mean while every spark of life might be extinguished. On the other hand, bronchotomy (performed by a man of ordinary care and skill) is an operation free from danger. It may be executed with a penknife, if no better instrument be at hand; and, when the incision has been made, a pair of common bellows will suffice for the inflation of the lungs. Did I conceive, that bronchotomy were a perilous operation; that the lungs could be effectually distended without the employment of bellows; that the object could generally be accomplished as expeditiously without cutting into the trachea; I should be as ready to join in the condemnation of this last proceeding, as any cotemporary writer. Greatly, however, as I respect most of the authors, who differ from me on this point, the reasons I have assigned, prevent me from subscribing to their sentiment. Desault, who may be regarded as the founder of the doctrine, concerning the inutility of bronchotomy, it is also to be observed, spoke only from theory, and not actual practice, in these cases.

### DESCRIPTION OF THE OPERATION.

No preparation is necessary, as delay only increases the danger. The patient being seated in an arm-chair, or, what is better, laid on a bed with his head hanging backward, an incision is to be made, which is to begin below the cricoid cartilage, and to be continued downward, about two inches, along the space between the sterno-thyroidei muscles. Care should be taken not to cut the lobes of the thyroid gland, lest a troublesome and dangerous bleeding be occasioned, and, as the left subclavian vein lies a little below the upper part of the first bone of the sternum, the incision should on no account ever extend in the least below the top of this bone. The knife must not be carried either to the right or left, in order to avoid all risk of injuring the large blood vessels situated at the sides of the trachea. The incision in the integuments being made, the sterno-thyroidei muscles are to be pushed a little towards the side of the neck, so as to bring the trachea fairly into view. Most authors recommend the point of the knife to be then introduced between the third and fourth cartilage of the trachea, and the opening to be enlarged transversely. It is true, that, in this way, an opening may be safely made, large enough to allow of the introduction of a small cannula. It is safer, however, in all cases, to enlarge the opening in the perpendicular direction, by cutting from within outward. There is no advantage in avoiding a wound of the cartilages of the trachea, and this was the only reason for cutting the membrane between two of them, in a transverse direction; while a sufficiently large opening could not thus be safely obtained in cases in which it is necessary to introduce the muzzle of a pair of bellows, in order to inflate the lungs. In short, it is safer and better, in every instance, to make the wound in the trachea in a perpendicular manner.

I have stated, that bronchotomy may be performed by a man of ordinary skill, without hazard. It is far otherwise with a careless practitioner. We read in Desault's work, that, in one instance, the carotid artery was wounded. The following cautions, given by Mr. A. Burns, seem entitled to notice. "The arteria innominata is in risk in some subjects. I have seen it mounting so high on the forepart of the trachea, as to reach the lower border of the thyroid gland. Even the right carotid artery is not always safe. I am in possession of a cast, taken from a boy of twelve years of age, which shews the right carotid artery crossing the trachea in an oblique direction. In this subject, that vessel did not reach the lateral part of the trachea till it had ascended two inches and a quarter above the top of the sternum.

"Where both carotid arteries originate from the arteria innominata, there is considerable danger in performing the operation of tracheotomy, for, in such cases, the left carotid crosses the trachea pretty high in the neck. Professor Scarpa has seen a specimen of this distribution in a male subject, and I have met with five.

"These varieties in the course of the arteries are worthy of being known, and remembered; they will teach the operator to be on his guard, since he can never, *a priori*, ascertain the arrangement of the vessels with any degree of certainty. It will impress on his mind the impropriety of using the knife further, than merely to divide the integuments and fasciæ. If he then clear the trachea with the fingers, he will never injure any of the large arteries. When, with the finger, he has fairly brought the trachea into view, he ought to examine carefully, whether any of the large arteries lie in front of it, and if he find one, he ought to depress it toward the chest, before he penetrates into the windpipe.

"In cutting into the trachea, the preferable plan is to cut the rings from below upward, avoiding injury of the thyroid gland." (See *A. Burns on the Surgical Anatomy of the Head and Neck, p.* 393, 394.)

When bronchotomy is performed for the purpose of inflating the lungs, the cut in the windpipe must be made somewhat larger than when only an opening is required to enable the patient to breathe through a small cannula. The larger size of the pipe of the bellows, is the reason of this circumstance.

When a cannula is to be introduced, care must be taken not to pass it too far into the wound, lest it should injure the opposite side of the trachea. This is a caution, on which Fabricius ab Aquapendente dwells very strongly, and with good reason.

Small as the vessels may be, which are divided in bronchotomy, they occasionally bleed so much, as to create apprehension, and even prevent the continuance of the operation. There is a case in Van Swieten's Commentaries, confirming this remark. A

Spanish soldier, aged twenty-three, was in the most urgent danger from an inflammation of his throat. It was thought nothing could save him, except bronchotomy. After the longitudinal cut in the skin, and the separation of the muscles, the trachea was opened between two of the cartilages; but the blood insinuated itself into this canal, and excited so violent a cough, that the cannula could not be kept in by any means, though it was replaced several times. M. Louis remarks, that, in this instance, the patient's head should have been turned downward, in order to keep the blood from flowing backward into the trachea. It is asserted, that the opening of this tube was not always opposite the external wound, in consequence of the convulsive action of the muscles, and that the patient on this account could hardly breathe. Hence M. Vigili was induced to slit open the trachea, down to the sixth cartilaginous ring; and it was only then that he inclined the patient's head forward. The bleeding now ceased, the patient breathed with ease, and, on the second day, the inflammation was so much better, that respiration went on without the aid of the opening in the trachea.

To obviate the preceding accident, a proposal has been made to adapt a cutting blade to a cannula, of a suitable size, calculated for remaining in the wound, and sufficiently compressing the orifices of such vessels as may be opened. In Richter's *Observationes Chirurgicæ*, a description of some instruments of this kind may be seen. Mr. B. Bell has described one, somewhat like a flattened trocar, only not quite so long. The patient's head being inclined backward, as far as possible, the point of the instrument is to be introduced between two of the cartilages: between the lower margin of the thyroid, and the upper edge of the cricoid, is said to be the best situation, being more extensive, less vascular, and, after the division of the skin, there being only the crico-thyroid ligament to be divided. When the instrument has entered, the lancet is to be withdrawn, and the cannula fixed, by means of a ribbon, which is tied to each of the wings of the instrument, and must be fastened at the back of the patient's neck. Should the instrument be too long, it must be passed through two or three little compresses, before being put into the windpipe, which artifice will make it answer as well as if it were shorter. A piece of gauze is then to be tied over the outward orifice of the cannula.

A more simple and natural mode, however, of obviating all trouble from the entrance of blood into the trachea, is to tie any bleeding branch of the thyroid artery, or vein, before making the opening into the windpipe.

Sometimes, though very seldom, the cannula becomes obstructed with mucus, or clots of blood. Such an accident nearly suffocated a patient at Edinburgh. A man of genius, who was at hand, suggested the introduction of a second cannula into the first; the second one being taken out, and cleaned, as often as necessary, and then replaced. Monro, the father, used to recommend this plan. It is better, however, to have at once a double cannula, to fit the stilette.

The use of the cannula must be continued as long as the causes, obstructing respiration, remain.

When respiration is suspended by the presence of a foreign body in the trachea, and the extraneous substance does not make its appearance at the opening made, a trial may be made to discover its situation by means of a bent probe. When it lies downward, which it hardly ever does, the wound in the trachea may be enlarged in this direction, and the body may be extracted with a pair of curved forceps. The extraneous substance is mostly forced out by the air, as soon as the incision in the trachea is opened. When it cannot be immediately found, some practitioners (Heister and Raw) have succeeded by keeping the lips of the wound asunder with pieces of sheet-lead, by which means, the force of the air in expiration has, in a few hours, expelled the foreign body.

Richter thinks he has perfected bronchotomy, by using a curved cannula; but, the inconveniences, which he attaches to the straight one, hardly ever occur. A curved cannula cannot be so conveniently introduced into another one similarly shaped.

In some instances a cannula has been borne quietly in the trachea, while in others, it has produced so much irritation, cough, and sense of choaking, as to render its immediate removal necessary. Mr. Lawrence, in speaking of the obstruction of the glottis from the disease already adverted to in this article, observes, that, when the cannula causes inconvenience, he should advise a longitudinal incision, of about half an inch, in the middle of the trachea, and the removal of a thin slip of the tube, which would leave an artificial opening for respiration equal in size to the natural one. (See *Medico-Chir. Trans. Vol.* 6, *p.* 249.)

On the continent, the operation of laryngotomy, which was first advised, by Vicq. d'Azyr, and is recommended by Desault, is mostly preferred to tracheotomy. The surgeon makes an incision over the anterior part of the thyroid cartilage, punctures the crico-thyroid membrane, and, if it be necessary, introduces a director, and slits the thyroid cartilage upwards. A mere opening in the crico-thyroid membrane would suffice for the introduction of a cannula for the purpose of enabling the patient to breathe; in most other instances, it would be necessary also to cut the thyroid cartilage. The fact, that extraneous substances, when they are loose, are almost always lodged at the upper part of the larynx, indicates, that bronchotomy in such cases must commonly be most advantageous; and, according to Desault, even when the foreign bodies are lower down in the trachea, they may in general be most easily extracted with the aid of a pair of curved forceps. In this country, laryngotomy has had few advocates, though it was, a few years since, commended by Mr. Coleman

"Of the three situations (says Mr. Lawrence), in which it has been proposed to make the opening, viz. in the thyroid cartilage, between that and the cricoid, or in the trachea, I consider the first as the least eligible. Besides the objections from the ossification of the cartilage, and the danger of wounding, or otherwise injuring, the chordæ vocales, there is the inconvenience in the case of angina laryngea, arising from the swoln and thickened state of the membrane, which may actually impede the passage of the air." (See *Medico-Chir. Trans. Vol.* 6, *p.* 248.)

The reader may collect the most valuable information on the foregoing subject from the following sources: *Hevin sur les corps Etrangers qui sont arrêtes dans les premieres Voies, et qu'il faut tirer par incision, in Mém. de l'Acad. Royale de Chirurgie, Tom.* 3, *p.* 131, *&c. edit.* 12*mo. Louis, Mémoire sur une question Anatomique relative a la jurisprudence, où l'on établit les principes pour distinguer, à l'inspection d'un corps trouvé pendu, les signes du suicide d'avec ceux de l'assassinat. Van Swieten's Commentaries. Habicot, Question Chirurgicale, par laquelle il est démontré que le Chirurgien doit assurément pratiquer l'opération de la Bronchotomie, &c. published,* 1620. *Mémoire sur la Bronchotomie par M. Louis, in Mém. de l'Acad. de Chirurgie, Tom.* 12, *Edit.* 12*mo. Second Memoir on this subject, inserted by the same writer in the said volume. De la rescission des Amygdales, Tom.* 14, *p.* 283, *&c. Précis d'Observations sur le Gonflement de la Langue, &c. par M. de la Malle, Tom.* 14, *p.* 408. *Lescure, sur un portion d'Amande de noyau d'Abricot, dans la Trachée Arterè, Tom.* 14. *p.* 427. *Suite d'Observations sur les Corps Etrangers dans la Tranchée Arterè, Tom.* 14, *p.* 432. *Expériences sur ces Cas par M. Favier, Tom.* 14, *p.* 445. *Bertrandi, Traité des Opérations de Chirurgie, p.* 402, *&c. Edit.* 1784. *Sabatier, de la Médecine Operatoire, Tom.* 2, *p.* 283, *Edit.* 1. *Œuvres Chirurgicales de Desault par Bichat, Tom.* 2, *p.* 236, *&c. Pelletan, Clinique Chirurgicale, Tom.* 1, *First Memoir. Cheyne, Pathology of the Larynx and Bronchia. A. Burns, Surgical Anatomy of the Head and Neck, p.* 377, *to* 401. *Richter's Anfangsgrunde der Wundarzneykunst, Band* 4, *p.* 225, *&c. Gottingen,* 1800. *Lawrence on some affections of the larynx, which require the operation of bronchotomy, in Medico-Chirurgical Trans. Vol.* 6, *p.* 221, *&c. Baillie in Trans. of a Society for the Improvement of Medical and Chirg. Knowledge, Vol.* 3. *Philos. Trans.* 1730, *No.* 416, *Art.* 5. *Journal de Médecine, T.* 38, *p.* 358.

**BUBO.** (βȣϐων, the groin.) Modern surgeons mean, by this term, a swelling of the lymphatic glands, particularly of those in the groin, and axilla.

The disease may arise from the mere irritation of a local disorder; from the absorption of some irritating matter, such as the venereal poison; or from constitutional causes.

Of the first kind of bubo, that, which is named the *sympathetic*, is an instance. Of the second, the venereal bubo is a remarkable specimen. (See *Venereal Disease.*)

The *pestilential bubo*, which is a symptom of the plague, and the *scrofulous* swellings of the inguinal and axillary glands; may be regarded, as examples of buboes from constitutional causes. (See *Scrofula.*)

The inguinal glands often become affected with simple phlegmonous inflammation, in consequence of irritation in parts, from which the absorbent vessels, passing to such glands, proceed. These swellings ought to be carefully discriminated from others, which arise from the absorption of venereal matter. The first cases are simple inflammations, and only demand the application of leeches, the cold saturnine lotion, and the exhibition of a few saline purges; but the latter diseases render the administration of mercury indispensable.

*Sympathetic* is the epithet usually given to inflammation of glands from mere irritation; and, we shall adopt it, without entering into the question of its propriety.

The sympathetic bubo is mostly occasioned by the irritation of a virulent gonorrhœa. The pain, which such a swelling gives, is very trifling, compared with that of a true venereal bubo, arising from the absorption of matter, and it seldom suppurates. However, it has been contended, that the glands in the groin do sometimes swell and inflame from the actual absorption of venereal matter from the urethra, in cases of gonorrhœa, and which swellings must consequently be venereal. (*Hunter on the Venereal, p.* 57.)

The manner, in which buboes form from mere irritation, will be better understood by referring to the occasional ill consequences of venesection, in the article *Bleeding.* The distinguishing characters of the venereal bubo are noticed in the article *Venereal Disease.*

**BUBONOCELE.** (from βȣϐων, the

groin, and κηλη, a tumour.) A species of hernia, in which the bowels protrude at the abdominal ring. The case is often called an *inguinal hernia*, because the tumor takes place in the groin. Every thing, necessary to be known on this subject, will be found in the article *Hernia.*

**BURNS.** A burn is an injury, more or less superficial, occasioned by the contact of some substance, heated beyond what the body can bear, without its fibres and organization being hurt. Under this appellation is comprehended every injury occasioned by heat, or fire, from the slightest redness of the skin, to the most extensive and deep seated destruction of the solid parts. Burns are usually divided into three kinds. 1st. Into such as produce an inflammation of the cutaneous texture, but an inflammation, which, if it be not improperly treated, almost always manifests a tendency to resolution. 2dly. Into burns, which injure the vital powers of the cutis, occasion the separation of the cuticle, and produce suppuration on the surface of the cutaneous texture. 3dly. Into burns, in which the vitality and organization of a greater or less portion of the cutis are either immediately or subsequently destroyed, and a soft slough or hard eschar produced. (See *Thomson's Lectures on Inflammation*, *p.* 585, 586.)

Suppuration is not always an unavoidable consequence of the vesications in burns; but it is a common and a troublesome one. "In severe cases, it may take place by the second, or third day; often not till a later period. It often occurs without any appearance of ulceration; continues for a longer, or shorter time; and is at last stopped by the formation of a new cuticle. In other instances, small ulcerations appear on the surface or edges of the burn. These spreading form extensive sores, which are in general long in healing, even where the granulations, which form upon them, have a healthy appearance." (*Op. cit. p.* 595.)

Burns present different appearances, according to the degree of violence, with which the causes producing them have operated, and according to the kind of cause, of which they are the effect. Burns, which only irritate the surface of the skin, are essentially different from those, which destroy it; and these latter have a very different aspect from what others present, which have attacked parts more deeply situated, such as the muscles, tendons, ligaments, &c. Scalds, which are the effect of heated fluids, do not exactly resemble burns, occasioned by the direct contact of very hot metallic bodies, or some combustible substance on fire. As fluids are not capable of acquiring so high a temperature, as many solid things, scalds are generally less violent than burns, in the injury which they produce; but, in consequence of liquids often flowing about with great rapidity, and being suddenly thrown in large quantities over the patient, scalds are frequently dangerous on account of their extent. It is well worthy of remark, that the danger of the effects of fire is more proportioned to the size than the degree, of the injury. A burn, that is so violent, as to kill parts at once, may not be in the least dangerous, if not extensive; while, a scald, which perhaps only raises the cuticle, may prove fatal, if very large. The degree of danger, however, is to be rated from a consideration both of the size and violence of the injury. The worst burns, which occur in practice, arise from explosions of gunpowder, or inflammable gases, from ladies' dresses catching fire, and from the boiling over of hot fluids, in laboratories, manufactories, &c.

Burns, which only destroy the cuticle, and irritate the skin, are very similar to the effects, produced by cantharides and rubefacients. The irritation, which such injuries excite, increases the action of the arteries of the part affected, and they effuse a fluid under the cuticle, which becomes elevated, and detached. Hence, the skin becomes covered with vesicles, or bladders, which are more or less numerous, and large, according to the manner, in which the cause has operated. But, when the skin, or subjacent parts, are destroyed, no vesicles make their appearance. In this circumstance, a black eschar is seen; and when the dead parts are detached, there remains a sore, more or less deep, according to the depth, to which the destructive effects of the fire have extended.

The parts may either be killed, at the moment of the injury, by the immediate effect of the fire, or they may first inflame, and then mortify.

In all cases of burns, the quantity of injury depends on the degree of heat in the burning substance; on the duration, and extent of its application; and on the sensibility of the burnt part.

When a large surface is burnt, mortification sometimes makes its appearance with great violence, and very quickly after the accident; but, in general, the symptom, the most to be dreaded, in such cases, is inflammation. The pain and irritation often run to such a pitch, that, notwithstanding every means, there is frequently immense trouble in keeping down the inflammation. When the burnt surface is very large, the effects of the inflammation are not confined to the part, which was first injured; but, even cause a great deal of fever; and, in certain cases, a comatose state, which may end in death.

It has been observed, that persons, who die of severe burns, seem to experience a remarkable difficulty of breathing, and oppression of the lungs. These organs, and the skin, are certainly both concerned in separating a large quantity of water from the circulation, and their participating in this function may, perhaps, afford a reason for the lungs seeming to be affected, when a large surface of skin is injured in cases of burns. However, the kidneys perform the same office, and they are not particularly affected in burnt patients; so that the asthmatic symptoms, in these cases, are probably owing to a sympathy between the lungs and skin, or rather to causes not at present understood.

### TREATMENT OF BURNS.

The common plan of treating burns some years ago was founded on principles, which seem applicable to cases of inflammation in general. The treatment was for the most part antiphlogistic, and even copious bleeding from the arm was not unfrequently practised.

Two general methods of treating burns, however, have at all times been followed. One consists of the application of substances, which produce a cooling, or refrigerant effect; the other is to employ calefacient, or stimulating substances. Dr. Thomson is satisfied that each of these different modes may have its peculiar advantages in the particular cases to which it is adapted. (*Lect. on Inflammation*, p. 588.)

We shall first offer an account of the practice, mostly resorted to in this country some years since, as explained by Mr. B. Bell. When the skin is not destroyed, but seems to suffer merely from irritation, relief may be obtained by dipping the part affected in very cold water, and keeping it for some time immersed. This author states, that plunging the injured part suddenly into boiling water would also procure ease; an assertion, however, much to be doubted, and a practice not likely to be imitated. In some cases, emollients afford immediate relief; but, in general, astringent applications are best. Strong brandy, or alcohol, is particularly praised. At first the pain is increased by this remedy; but an agreeable soothing sensation soon follows. The parts should be immersed in the spirit, and, when this cannot be done, soft old linen, soaked in the application, should be kept constantly on the burn. Goulard's lotion, or a strong solution of the cerussa acetata, is recommended. It is said to prove useful, however, only by being astringent, as equal benefit may be derived from a strong solution of alum, &c. Such applications were frequently made with a view of preventing the formation of vesicles; but, Mr. B. Bell always remarked, there was less pain, when the blisters had already appeared, than when prevented from rising, by remedies applied immediately after the occurrence of the injury.

The applications should be continued, as long as the pain continues; and in extensive burns, creating great irritation, opium should be prescribed. The stupor, with which patients, so situated, are often attacked, receives more relief from opium, than any thing else.

Some recommend opening the vesications immediately; others assert, that they should not be meddled with. Mr. B. Bell thinks, they should not be opened till the pain arising from the burn, is entirely gone. At this period, he says, they should always be punctured; for, when the serum is allowed to rest long upon the skin beneath, it has a bad effect, and even induces some degree of ulceration. Small punctures, not large incisions, should be made. All the fluid having been discharged, a liniment of wax and oil, with a small proportion of saccharum saturni, is to be applied.

On the subject of opening the vesications in burns, Dr. Thomson believes, that the diversity of opinion arises from the different effects resulting from the particular manner, in which the opening is made. "If a portion of the cuticle be removed, so as to permit the air to come into contact with the inflamed surface of the cutis, pain and a considerable degree of general irritation will necessarily be induced; but, if the vesications be opened cautiously with the point of a needle, so as to allow the serum to drain off slowly, without at the same time allowing the air to enter between the cuticle and cutis, the early opening of the vesications will not only not occasion pain, but will give considerable relief, by diminishing the state of tension, with which the vesications are almost always, in a greater or less degree, accompanied. When opened in this manner, the vesications often fill again with serum; but, the punctures may be repeated as often as is necessary, without any hazard of aggravating the inflammation. Great care should be taken, in every instance, to preserve the raised portion of cuticle as entire as possible," &c. (See *Lectures on Inflammation, p.* 595.)

When there is much irritation and fever, blood-letting, and such remedies, as the particular symptoms demand, must be advised. On account of the pulse being frequently small, quick, and vibratory, bleeding is at present not often employed. As Dr. Thomson remarks, however, it may become necessary in patients of a strong robust constitution, in whom the symptomatic fever assumes an inflammatory type. He has often seen a single bleeding procure great relief in these cases; and he does not remember a case of burns, where bleeding was followed by injurious effects. (*P.* 594.) When the skin ulcerates, the treatment does not differ from what will be described, in speaking of *Ulcers.*

When the burnt part, is, from the first, more or less destroyed, cooling emollient applications were formerly thought most effectual, and a liniment, composed of equal proportions of lime-water and linseed oil, gained the greatest celebrity. Even, at this day, the application is very often employed. Mr. B. Bell advises it to be put on the parts, by means of a soft pencil, as the application and removal of the softest covering, are often productive of much pain.

In some cases, Mr. B. Bell says, Goulard's cerate, and a weak solution of the saccharum saturni, procure ease more quickly, than the above liniment.

The sloughs having come away, the sores are to be dressed according to common principles. (See *Ulcers.*)

When burns are produced by gunpowder, some of the grains are apt to be forced into the skin. These should be picked out with the point of a needle, and an emollient poultice applied, which will dissolve and bring away any particles of gunpowder, which may yet remain.

Burnt parts, which are contiguous, are apt to grow together in the progress of the cure. The fingers, toes, sides of the nostrils, and the eye-lids are very liable to this occurrence. It is to be prevented by keeping dressings always between the parts, likely to become adherent, until they are perfectly healed.

The sores, resulting from burns, are, perhaps, more disposed, than any other ulcers, to form large granulations, which rise considerably above the level of the surrounding skin. No poultices should now be used. The sores should be dressed with any moderately stimulating, astringent ointment: the ung. lapid. calaminaris, or the basilicum with the pulv. hydrarg. nitrat. rub. is now generally preferred: and, if the part will allow of the application of a roller, the pressure of this will be of immense service in keeping down the granulations, and rendering them more healthy. When these methods fail, the sores should be gently rubbed with the argentum nitratum.

In the dry and hot state of the skin, Dr. Thomson is an advocate for diaphoretics. "Laxatives (says he) are often necessary; but, it is in general best to employ only the gentler sort, on account of the trouble and pain, which moving always gives the patient. Anodynes are often required, not only to procure sleep, but even a temporary alleviation of the pungency of the pain, which the burn occasions. A mild vegetable and farinaceous diet should be used during the period of the symptomatic fever. Animal food, wine, and other cordials, may be required in the progress of a suppurating burn; but, they are not necessary at first, and when given in this stage, are almost always injurious." (See *Lectures on Inflammation, p.* 594.)

With respect to the topical applications recommended by this gentleman, he generally prefers in cases of superficial burns cooling and refrigerant remedies. When there are vesications, and suppuration takes place without ulceration, he advises us, after refrigerants have ceased to produce beneficial effects, to use the linimentum aquæ calcis. In cases, however, in which cicatrization is long in being induced, he recommends, instead of this liniment, ointments containing lead, or zinc, particularly, the unguentum lapid. calaminaris.

In the ulcerating state of suppurating burns, he prefers emollient cataplasms. But, when the discharge continues, or becomes more profuse with poultices, they are to be left off, and astringent washes used, such as lime-water, compound decoction of oak bark, a weak solution of the sulphate of copper, &c.

In burns, where the parts are destroyed and converted into sloughs, Dr. Thomson does not think it matters much whether we employ first, vinegar, oily liniments, turpentine, spirits of wine, or emollient poultices. He acknowledges, however, that the poultice is the remedy, under the application of which, the separation of the dead parts is most easily and agreeably accomplished. "The question (says he) at present most deserving the attention of medical practitioners, with regard to the use of the warm emollient poultice in burns, is, whether we should apply it immediately after the burn has been received, or interpose for some hours, as has been so strongly recommended, dressings with vinegar, spirits of wine, or oil of turpentine. My own experience has not been sufficient to enable me to determine this point to my entire satisfaction. Yet I think it right to state to you, that in a number of trials made at different times, I have had occasion to see burns, to which common emollient poultices had been from the first applied, slough and granulate faster, and in a more kindly manner, than similar burns in the same persons, to which in some instances the Carron oil (lin. aq. calcis.) and, in others again, oil of turpentine, were applied at the same time with the poultices." (See *Lectures on Inflammation, p.* 609.)

### MR. CLEGHORN'S PLAN.

Mr. Cleghorn recommends the immediate application of vinegar, which is to be continued for some hours, by any the most convenient means, until the pain abates. Should it return, the vinegar is to be repeated. If the burn is so severe as to have destroyed any part, when the pain has ceased, it is to be covered with a poultice, which must remain on six, or, at most, eight hours. When this is removed, the part is to be entirely covered with very finely powdered chalk, so as to make every appearance of moisture on the surface of the sore, no longer visible. This being done, the whole is to be covered with the poultice again. The same mode is then to be pursued every night and morning, until the cure is complete. If the use of poultices should seem to relax the ulcers too much, a plaster, or ointment, containing white lead is to be applied; but, the chalk is still to be used next the sore.

In respect to general remedies, Mr. Cleghorn allowed his patients to eat boiled, or roasted fowl, or, in short, any plain-dressed meat, they liked. He did not object to their taking moderate quantities of wine, spirits and water, ale, or porter. His applications, he observed, allayed pain and inflammation, and either prevented, or removed fever, and, judging from their effects, he thought they had powerful antiseptic virtues. He never had occasion to order bark, or any internal medicines whatever, and he only once thought it necessary to let blood. When a patient was costive, Mr. Cleghorn used to order boiled pot-barley and prunes, or some other laxative nourishing food, and sometimes an injection, *but never any purgative.* It is distressing to a patient with bad sores, to be often going to stool. Besides, Mr. Cleghorn remarked, that weakness and languor, (which never, in his opinion, hasten the cure of any sore) are always brought on, more or less, by purgatives. From the effects, too, which he felt them have upon himself, and observed them to have upon others, they did not seem to him to have so much tendency to remove heat and feverish symptoms as is generally supposed, and more frequently carry off *useful* humours, than *hurtful* ones.

Diluted sulphuric acid would not answer well, instead of vinegar. The latter produced most benefit, when it was fresh and lively to the taste.

In cold weather, in particular, Mr. Cleghorn used to warm the vinegar a little, place the patients near the fire, give them something warm internally, and, keep them, in every respect, in a comfortable situation. His object, in so doing, was to prevent the occurrence of tremblings, and chilness, which, in two instances, alarmed him a good deal, after employing vinegar, which was too cold.

The account of Mr. Cleghorn's plan, was published by Mr. Hunter, in the *Med. Facts and Observations, Vol.* 2.

### SIR JAMES EARLE'S PLAN.

This gentleman exclusively advises the use of cold water, or rather ice; and he has brought forward several cases of extensive burns, in which this method was employed with the best effect. We have mentioned cold water, among the applications to burns, enumerated by Mr. B. Bell, and it was certainly not uncommonly used long before Sir James Earle published on the subject. The method indeed is very ancient. "Cold is a remedy (says Dr. J. Thomson) which has long been employed to diminish the inflammation of superficial burns. Rhazes directs, that, in recent burns, cloths dipt in cold water, or in rose-water cooled with snow, be applied as soon as possible to the parts, which have been injured, and that these cloths be renewed from time to time; and Avicenna says, that this practice often prevents the formation of blisters." (*Lectures on Inflammation, p.* 589.) Sir James Earle's publication, however, drew considerable attention to the subject, and certainly had the good effect of leading surgeons to try the method in a great number of instances, in which other more hurtful modes of treatment might otherwise have been employed. The burnt parts may either be plunged in cold water, or they may be covered with linen dipped in the same, and renewed as often as it acquires warmth from the part. The application should be continued as long as the heat and pain remain, which they will often do, for a great many hours. (See *Essay on the Means of lessening the Effects of Fire on the Human Body.* 1799.)

Some caution, however, in the application of cold becomes necessary, when a scald is of very large size, or situated upon the trunk of the body. In extensive burns, however superficial they may be, the patient is liable to be affected with cold shiverings; and these shiverings may be greatly aggravated by exposure, and by the application of cold. In instances of this sort, therefore, warm applications ought perhaps to be preferred. (*Dr. J. Thomson's Lectures on Inflammation, p.* 591.)

### M. LARREY'S PLAN.

It seems to me, that, on the subject of burns, there is, even at the present day, as much contrariety of sentiment, as in any part of surgery whatsoever. After all the praises, which we have of late years heard of vinegar, cold applications, oil of turpentine, &c. a French surgeon, whose talents, and opportunities of observation, entitle his opinion to the highest attention, has recently censured the employment of all such remedies. M. Larrey, though a military surgeon, has had occasion to see numerous burns, in consequence of explosions. He declares, that he has been long struck with the bad effects of repellents, such as fresh water with the muriate of ammonia, oxycrate, the aqua vegeto-mineralis, and the solution of opium in ice-water, applications, which are extolled in some modern books, and used in cases of deep burns, by a great number of practitioners; and he expresses his belief, that such injuries frequently prove mortal, for want of more judicious treatment. He recommends dressing all deep burns, with fine old linen, spread with saffron ointment, which, he says, has the quality of diminishing the pain, and preventing irritation by keeping the nervous papillæ from coming into contact with the air, or being pressed by the linen and clothes. The employment of this ointment, (or, in case good oil cannot be procured for its composition, honey, instead of it) is to be continued till suppuration takes place. When this is established, M. Larrey applies the ointment of styrax, for the purpose of supporting the systaltic power of the subjacent vessels, promoting the detachment of the eschars, and checking the extension of the sloughing. As soon as the dead parts have separated, Mr. Larrey again has recourse to the saffron ointment, for which he gradually substitutes dry lint, with strips of linen spread with cerate. When the vessels exceed the level of the edge of the sore, he touches them with the argentum nitratum, and he occasionally applies a weak solution of the muriate of mercury, or of the sulphate of copper.

M. Larrey prescribes emollient and antispasmodic beverages, which are to be taken warm, such as milk of almonds, containing nitre, and properly sweetened; hydromel; rice ptisan, &c. His patients were never deprived of light nourishment, such as broths, jellies, eggs, soups, &c. His experience had taught him, that soldiers (who it is to be observed were his patients) cannot bear low diet, so well as persons leading an inactive life. Besides, he remarks, that, as these injuries, with loss of substance, are a long time in healing, it would be acting contrary to the precept of Hippocrates to put burnt patients on low diet. M. Larrey assures us, that he has found this simple treatment, which he calls soothing and gently tonic, almost always successful. (See *Mémoires de Chirurgie Militaire, Tom.* 1, *p.* 93.)

### MR. KENTISH'S PLAN.

From what has been stated, it appears, that cold and hot, irritating and soothing, astringent and emollient applications, have all been outwardly employed, in cases of burns, without much discrimination.

But, the internal treatment has always been of one kind, and both the ancients and moderns agree in advising blood-letting, cooling purges, and, in short, the whole of the antiphlogistic plan. Mr. Kentish is the only one who has ventured to put in practice stimulating means, internally, as well as externally. It is to be remarked, at the same time, that Mr. Cleghorn's practice was somewhat analogous to that recommended by the latter gentleman. He condemned purges, and he allowed his patients to take stimulants internally.

The theories advanced by Mr. Kentish, which, however, are very objectionable, lead him to lay down two practical indications, in injuries caused by a pernicious quantity of heat, suddenly applied to a part of the body, and which injuries are attended with increased action. The two indications, for restoring the unity of action, are, first, gradually diminishing the excitement, or action, of the part; secondly, increasing the action of the system to meet the increased action of the part, holding this law as the system in view: *That any part of the system, having its action increased to a very high degree, must continue to be excited, though in a less degree, either by the stimulus, which caused the increased action, or some other having the nearest similarity to it, until by degrees the extraordinary action subsides into the healthy action of the part.*

With this view, holding the part to the fire seems the best mode of relief; but, as parts of the body are injured, to which this cannot be done, the most stimulant applications must be had recourse to; for, in this class, there is little fear of any of them being greater, than that which originally caused the accident. The strongest rectified spirits, made still stronger by essential oils, are proper, and may also be heated as much as the sound parts can bear. These, and many more applications of the same class, says Mr. Kentish, will give the speediest and most effectual relief. These are only to be continued for a certain time, otherwise they may afterwards cause the very ill they were given to cure. They are then to be succeeded by less stimulant applications, until the parts act by common natural stimuli.

The internal mode of relief is to give those substances, which soonest excite the system to great action, such as æther, ardent spirits, opium, wines, &c. by which means the solution of continuity of action is allowed to continue the shortest time possible, and the unity of action restored, which constitutes the cure.

Suppose, for instance, as a local application, we at first apply the strongest alcohol, heated to the degree, which the sound part would bear without injury: it should afterwards be gradually diluted until it becomes proof-spirit, and the heat should be diminished, although gradually, as cold is always pernicious, bringing on that tendency to shiver, which should ever be continually guarded against, as being a most hurtful symptom, and the forerunner of a violent sympathetic fever. To prevent this, the external heat should be kept at a high temperature, and the action of the whole system in as great a degree, as may be safe. By this means, you make the action of the whole meet the increased action of the part, by which, the lessening of the increased action of the part to join the action of the whole, is rendered more easy. Thus, there is, says Mr. Kentish, a unity of intention by both the external and internal means, which leads to the restoration of the unity of action, and thus is the cure performed.

It may be said, these circumstances can only take place when there is an increased action, and, that when the parts are destroyed, other means should be used, such as emollients, &c. In replying to this remark, Mr. Kentish distinguishes burns into two kinds; one, in which the action of the part is only increased; and, another, in which some parts have increased action, while other parts are destroyed. It is of little consequence, says Mr. Kentish, what is applied to the dead part, as the detachment of an eschar depends upon the action of parts, which remain alive, and not upon what is applied to those, which are dead. Mr. Kentish remarks, however, that he never saw an instance of a burn, in which, though some parts were totally destroyed, there were not always other parts, in which there was only increased action. Now as our duty is always to save living parts, our mode of cure, in the first instance, will always be the same, viz. to cure the parts, which have only an increased action, in the doing of which the dead parts will not be the worse, as their separation is a process of the system, which requires time, and, if the injury is to any extent, draws forth the joint efforts of the system, and even, says Mr. Kentish, calls up all the energy of its powers, to violent fever. This state should be supported by every artificial aid, in order to bring the parts to suppuration, otherwise the subject falls in the contest; for, if the living parts have not the power to throw off the dead, the dead will assimilate the living to themselves, and a mortification ensue.

When the living parts have been preserved, (continues Mr. Kentish,) which, according to this treatment, will be in the course of two or three days, the dead parts will be more plainly observed, and the beginning of the process to throw them off will be commencing. This process must be assisted by keeping up the powers of the system against debility, by stimulant medicines and a generous diet. The separation of the eschars will be greatly promoted by the application of the stimulus of heat, by means of cataplasms frequently renewed. These may be made of milk and bread, and some camphorated spirit, or any essential oils, sprinkled upon the surface. Such means need only be continued, until the suppuration is established, as then a different mode must be pursued.

After Mr. Kentish had supported the system to a suppuration, he then found that, gradually desisting from his stimulant plan, diminished the secretion of pus, and wonderfully quickened the healing process.

Thus we see, observes Mr. Kentish, the whole of the former treatment inverted. The most gentle soothing means were used externally and internally; these were continued until suppuration took place; and then the system was excited, under an idea of supporting it, which not unfrequently so fatigued the constitution, as to induce a hectic fever. The present mode is the reverse of this. When a part of the frame has been much excited, this part is not allowed to cease to act for want of stimulus, but, is kept in action by an adequate stimulus, which is to be gradually diminished, until the ordinary action returns. With the same view, the internal means are highly stimulant to the whole system, which must be supposed to be in a natural state at the time of the accident.

Thus increasing the action of the whole by strong stimuli, and decreasing the action of the part, by lessening the stimuli, the desired end will be more readily obtained; that is, equilibrium of the action will be restored.

When parts are destroyed, there must be other parts with increased action; and the foregoing mode will be the best for restoring the living parts, and promoting the separation of the dead ones. Suppuration having taken place, the exciting of the system by any thing stimulant, either by food, or medicine, should be cautiously avoided. Should the secretion of pus continue too great, gentle laxatives, and a spare diet, are indicated. If any part, as the eyes, for instance, remain weak, with a tendency to inflammation, topical bleedings, or small quantities of blood taken from the arm, are useful. To defend the new skin, camphorated oil, or camphorated oil and lime-water in equal parts, are good applications. Wounds of this kind heal very fast, when the diminution of pus is prevented, by attention to diet: if necessary to keep up the patient's strength, small doses of bark, taken two or three times a day, in some milk, will answer that purpose, and will not excite a quickened circulation, as wine, ale, or spirits, are apt to do. By attention to these principles, (continues Mr. Kentish,) I can truly assert, that I have cured very many extensive and dangerous burns and scalds, in one, two, three, and four weeks, which in the former method would have taken as many months; and some, which I believe to have been incurable by the former method.

After explaining his principles, Mr. Kentish takes notice of the several substances, which have commonly been employed. Of these he would chiefly rely on alcohol, the fluid volatile alkali, æther (so applied as to avoid the cooling process of evaporation,) and spirit of turpentine.

In applying these, we are directed to proceed, as follows: the injured parts are to be bathed, two, or three times over, with spirits of wine, spirits of wine with camphor, or spirit of turpentine, heated by standing in hot water. After this, a liniment, composed of the common yellow basilicon, softened with spirit of turpentine, is to be spread on soft cloth, and applied. This liniment is to be renewed only once in twenty-four hours, and, at the second dressing, the parts are to be washed with proof spirit, or laudanum, made warm. When a secretion of pus takes place, milder applications must be made, till the cure is effected.

The yellow ointment stops the pores of the cloth, impedes evaporation, and thus confines the effect of the alcohol to the burnt surface. The first dressings are to remain on four and twenty hours. Mr. Kentish thinks it of importance, that the injured surface should be left uncovered, as little as possible. It is, therefore, recommended, to have plasters, ready spread, before removing the old ones, and then only to take off one piece at a time.

It will seldom be necessary to repeat the application of alcohol a second time, or that of oleum terebinthinæ. The inflammatory action will be found diminished, and, according to Mr. Kentish's principles, the exciting means should therefore be diminished. Warm proof-spirits, or laudanum, may be substituted for the alcohol, and the unguentum resinæ flavæ is to be mixed with oleum camph. instead of turpentine. If this should be found too irritating, Mr. Kentish recommends ung. saturn. or cer. lap. calaminaris. Powdered chalk is to be used to repress the growth of exuberant granulations, and to absorb the pus. In the cavities of separated eschars, and in the furrows, between sloughs, and the living parts, he introduces powdered chalk. Then a plaster is applied, and, in tedious cases, a poultice over the plaster.

With respect to the internal treatment, the author observes, that great derangement of the system arises in certain persons, from causes, which, in others, produce no effect; and that this depends on a difference in the degree of strength. Hence, he concludes, that as strength resists the sympathetic irritative actions of parts, and weakness induces them, we should, in all cases, make the system as strong as we can, immediately upon the receipt of the injury. In considerable burns, he supposes a disproportion of action to take place, between the injured parts, and the system at large, or what, he styles, a solution of the continuity of action; and, that, by a law of the system, a considerable commotion arises, for the purpose of restoring the equilibrium, or enabling the constitution to take on the action of the part. Hence, Mr. Kentish is of opinion, that the indication is *to restore the unity of action of the whole system, as soon as possible,* by throwing it into such a state as to *absorb the diseased action,* and then gradually bring down the whole to the natural standard of action by nicely diminishing the exciting powers. Æther and alcohol, or other stimulants, are to be immediately given in proportion to the degree of injury; and repeated, once or twice, within the first twelve hours, and, afterwards, wine or ale is to be ordered, till suppuration takes place, when it will be no longer necessary to excite the system.

In a second essay, on the subject of burns, Mr. Kentish remarks, that, in the first species of burns, *in which the action of the part is only increased,* he has not found any thing better, for the first application, than the heated oleum terebinthinæ, and the digestive, thinned with the same. In superficial burns, when the pain has ceased, it will be advisable to desist from this application in about four and twenty hours, as that time in many cases will be sufficient, and, at the second dressing, a digestive, sufficiently thinned with common oil, will be adequate to the case, and, on the third day, we are to begin with the ceratum lap. calaminaris. Mr. K. has frequently seen secondary inflammation excited by the remedy. The most certain remedy, for this unpleasant symptom, is to apply a digestive thinned with oil, or a plaster of cerate, and over that a large warm poultice. The cerate will finish the cure. Should there be much uneasiness of the system, an anodyne, proportioned to the age of the patient, should be given.

The growth of fungus, and the profuse discharge of matter, are to be repressed, as already mentioned, by sprinkling powdered chalk on the surface, and by the use of purgatives, in the latter stages. The chalk must be very finely levigated.

Mr. Kentish's theories are, certainly, visionary; they may amuse the fancy, but, can never improve the judgment. He is a man, however, who has had superior opportunities of observing this part of practice, and the great success of his plan of treatment has acquired very extensive approbation, although there are still many practitioners, who prefer the common methods, and the antiphlogistic principles. The cicatrix of a burn is often of great extent, and, on this account, the subsequent absorption of the granulations on which the new skin is formed, (a process, by which the magnitude of the scar is afterwards lessened,) is so considerable, as to draw the neighbouring parts out of their natural position, and occasion the most unpleasant kinds of deformity. Thus, burns on the neck are apt to cause a distortion of the head, or even draw down the chin to the breast-bone; and in the limbs such contractions as fix the joints in one immoveable position. Simply dividing these contractions again mostly fails altogether, or only produces very partial and temporary relief, as after the cicatrization is completed, the new formed parts are absorbed, and the contraction recurs. A proposal has been lately made by my friend Mr. Earle, to cut away the whole of the cicatrix, and then bring the edges of the skin as much towards each other as possible, in the transverse direction, with strips of adhesive plaster. In one case, in which "from the forepart of the upper arm, to within about two inches of the wrist, a firm tense cicatrix, of an almost horny consistence, extended, which kept the elbow immoveably bent to a right angle," this gentleman performed such an operation. After removing the cicatrix, the flexor muscles at first made some resistance to the extension of the limb; but by degrees they yielded, and the arm was brought nearly to a right line. The whole limb was kept in this position by means of a splint and bandage. In the end, the contraction was cured, and the use of the limb restored. (See *Medico-Chirurg. Trans. Vol. 5, p. 96, &c.*)

Probably, as this patient was a young growing subject, only six years of age, the operation would have proved equally successful, if a simple division of the contracted skin had been made, and the arm kept extended for a length of time by the use of a splint. It is hardly necessary to observe, that cutting a large cicatrix entirely away, must always be a severe, and sometimes a dangerous operation: therefore, the avoidance of it, if possible, cannot but be desirable. (See *B. Bell's System of Surgery; Medical Facts and Observations, Vol. 2; Richter's Anfangsgrunde der Wundarzneykunst, Band.* 1. *Earle's Essay on the Means of lessening the Effects of Fire on the Human Body. Kentish's Two Essays on Burns. Larrey, Mémoires de Chirurgie Militaire, Tom.* 1, *p.* 93—96. *Boyer's Traité des Maladies Chir. T.* 1, *p.* 160. *Lectures on Inflammation, by John Thomson, p.* 585, *&c. Edinb.* 1813. *Lassus Pathologie Chirurg. T.* 2, *p.* 391. *Léveille, Nouvelle Doctrine Chir. T.* 4, *p.* 355. *Pearson's Principles of Surgery, p.* 171. *Edit.* 1808.)

**BURSÆ MUCOSÆ.** These are small membranous sacs, situated about the joints, particularly the large ones of the upper and lower extremities. For the most part, they lie under tendons. The celebrated Dr. A. Monro, of Edinburgh, published a very full account of the bursæ mucosæ, and also of their diseases. These parts are naturally filled with an oily kind of fluid, the use of which is to lubricate surfaces, upon which the tendons play, in their passage over joints. In the healthy state, this fluid is so small in quantity, that it cannot be seen without opening the membrane containing it; but, occasionally, such an accumulation takes place, that very considerable swellings are the consequence. Tumours of this sort are often produced by bruises and sprains, and, now and then, by rheumatic affections. These swellings are not often attended with much pain, though, in some cases, it is very acute, when pressure is made with the fingers. The tumours yield, in a certain degree, to pressure; but, they rise again, with an appearance of elasticity, not remarked in other sorts of swellings. At first, they appear to be circumscribed, and confined to a small extent of the joint; but, sometimes, the fluid, forming them, is so abundant, that they extend over a great part of the circumference of the limb. The skin, unless inflamed, retains its natural colour.

In this morbid state of the bursæ mucosæ, they contain different kinds of fluids, according to the cause of the disease. When the tumour depends on a rheumatic affection, the contents are ordinarily very fluid. They are thicker, when the cause is of a scrophulous nature. When the disease is the consequence of a bruise, or sprain, the effused fluid often contains hard concretions, and, as it were, cartilaginous ones, which are sometimes quite loose, and, more or less, numerous. Such substances may frequently be felt, when the tumour is examined with the fingers.

In practice, such distinctions are not of much consequence. While the swellings are not very painful, an attempt may be made to disperse them, by warm applications, friction (particularly, with camphorated mercurial ointment,) or blisters, kept open with the savin cerate. But, if these tumours should become very painful, and not yield to the above methods, Dr. Monro recommends opening them; a practice, however, which can seldom be really necessary, or proper. This author was continually alarmed at the idea of the bad effects of air admitted into cavities of the body, and, hence, in the operation even of opening the bursæ mucosæ, he is very particular in directing the incision in the skin, not to be made immediately opposite that made in the sac. Care must also be taken to avoid cutting the tendons, near the swelling.

Dr. Monro has seen cases, in which amputation became indispensable, in consequence of the terrible symptoms following the opening of bursæ mucosæ.

On account of such evil consequences, which are imputed to the air, though they would as often arise, were the same practice pursued in a situation, in which no air could have access at all, it has been recommended to pass a seton through the swelling, and to remove the silk, after it has remained just long enough to excite inflammation of the cyst, when an attempt is to be made to unite the opposite sides of the cavity by pressure.

I have never seen any swelling of this kind, which could not be discussed, by the means usually employed for promoting the absorption of other tumours. Indeed, the treatment should be very like that of Hydrops articuli. (See *Joints.*)

Consult *Monro's Works by his Son*; and *Latta's System of Surgery.*

# C.

**CÆSAREAN OPERATION.** Pliny, book 7. of his Natural History, gives us the etymology of this operation. *Auspicatiùs* (says he) *enectâ parente gignuntur, sicut Scipio Africanus prior natus, primusque Cæsarum à cæso matris utero dictus; quâ de causâ cæsones appellati. Simili modo natus est Manlius qui Carthaginem cum exercitu intravit.*

From this passage, we are to infer, that the Cæsarean operation is extremely ancient, though no description of it is to be found in the works of Hippocrates, Celsus, Paulus Ægineta, or Albucasis. The earliest account of this operation, to be found in any medical work, is that in the Chirurgia Guidonis de Cauliaco, published about the middle of the fourteenth century. Here, however, the practice is only spoken of, as proper after the death of the mother, and is alleged to have been adopted only at such a conjuncture in the case of Julius Cæsar. (See *Cap. de Extractione Fœtus.*) Vigo, who was born towards the close of the fifteenth century, takes no notice of the Cæsarean Operation; and Paré, who greatly improved the practice of midwifery, thinks this measure only allowable on women, who die undelivered. (*De Hominis Generatione, cap.* 31.) Rousset, who was cotemporary with Paré, collected the histories of several cases, in which the operation was said to have been successfully performed, and, after the publication of these, the subject excited more general interest, as we shall presently relate.

By the *Cæsarean operation*, is commonly understood that, in which the fœtus is taken out of the uterus, by making an incision into the abdomen, and through the parietes of that viscus. The term, however, in its most comprehensive sense, is applied to three different proceedings. It is sometimes employed to denote the incision, that is occasionally practised on the cervix uteri, in order to facilitate delivery; but, this particular method is named the *Vaginal Cæsarean Operation*, for the purpose of distinguishing it from the former, which is frequently called by way of contrast, the *Abdominal Cæsarean Operation.* With these cases, we have also to class the incision, which is made in the parietes of the abdomen, for the extraction of the fœtus, when, instead of being situated in the uterus, it lies in the cavity of the peritoneum, in consequence of the rupture of the womb, or in the ovary, or Fallopian tube, in consequence of an extra-uterine conception. This last operation, as Sabatier has remarked, is a species of gastrotomy. However, as it is very analogous to the abdominal and vaginal Cæsarean Operations, it can be most conveniently treated of in the present article. Following the plan, adopted by Sabatier, let us commence with the

### VAGINAL CÆSAREAN OPERATION.

A variety of causes, says Sabatier, may render this practice indispensable. A scirrhous hardness of the neck of the uterus is the most frequent. When the induration is such, that the cervix cannot become dilated, and the patient is exhausting herself with unavailing efforts, the parts should be divided in several directions. This has been successfully done under various circumstances. Cases have even been met with, in which the cervix uteri presented no opening at all, and yet the preceding operation proved quite effectual. Such is the example, which Doctor Simson has inserted in the third volume of the Edinburgh Essays. A woman, forty years of age, became pregnant, after recovering from a difficult labour, in which the child had remained several days in the passage. She had been in labour sixty hours; but the neck of the womb had no tendency to dilate.

Dr. Simson, perceiving that its edges were adherent, and left no opening betwixt them, determined to practise an incision, with the aid of a speculum uteri. The bistoury penetrated to the depth of half an inch, before it got quite through the substance, which it had to divide, and which seemed as hard as cartilage. As the opening did not dilate, in the efforts, which the woman made, it became necessary to introduce a narrow bistoury, on the finger, in order to cut this kind of ring in various directions. There was no hemorrhage; and the only additional suffering, which the patient encountered, arose from the distention of the vagina. As the child was dead, Dr. Simson perforated the head, in order to render the delivery more easy.

Strong convulsions, at the moment of parturition, may create a necessity for the vaginal Cæsarean Operation. These sometimes subside, as soon as the membranes are ruptured, and the waters discharged, so as to lessen the distention of the womb. However, if the convulsions continue, and the cervix uteri is sufficiently dilated, the child should be extracted by the forceps, or by the feet, according as the presentation may happen to be. On this subject, Baudeloque has recorded a fact, which was communicated to the Academy of Surgery by Dubocq, professor of surgery at Toulouse. The woman was forty years of age, and had been in convulsions two days. She was so alarmingly pale, that she could scarcely be known. Her pulse was feeble, and almost extinct, and her extremities were cold, and covered with a clammy perspiration. The edges of the opening, which was about as large as a crown piece, felt, as it were, callous, and hardly had this aperture been dilated, when delivery took place spontaneously. The child was dead. The symptoms were appeased, and the woman experienced a perfect recovery.

A considerable obliquity of the neck of the womb, combined with a pelvis, of which the dimensions are small, may also be a reason for the performance of the vaginal Cæsarean Operation. Not that such obliquity always occasions that of the rest of the uterus; nor is the neck of this viscus invariably directed towards that side of the pelvis, which is opposite to its fundus, although this is sometimes the case. In the latter circumstance, as the contractions of the uterus do not produce a dilatation of its cervix, which rests upon the bones of the pelvis, the adjacent part of that organ is dilated and pushed from above downwards, so as to present itself in the form of a round smooth tumour, without any appearance of an aperture. Such a case may have fatal consequences. Baudeloque furnishes us with an instance. A woman, in her first pregnancy, not being able to have the attendance of the accoucheur, whom she wished, put herself under the care of a midwife, who let her continue in labour-pains during three days. When the accoucheur came, on being sent for again, the child's head presented itself in the vagina, covered with the womb. The portion of the uterus, which included the fetus, was in a state of inflammation. The os tincæ was situated backward, toward the sacrum, hardly dilated to the breadth of a penny piece, and the waters had been discharged a long time. The patient was bled, and emollient clysters were administered. All sorts of fomentations were employed. She was laid upon her back, with her pelvis considerably raised. The accoucheur had much difficulty in supporting the head of the child, and keeping it from protruding at the vulva, enveloped, as it was, in the uterus. Notwithstanding such assistance, the patient died.

So fatal an event, says Sabatier, might have been prevented, by making the woman lie upon the side, opposite the deviation of the uterus, and employing pressure from above. If these proceedings had failed in bringing the os tincæ toward the centre of the pelvis, this opening might have been brought into such position, by means of the finger, in the interval of the pains, and kept so, until it were sufficiently dilated for the membranes to protrude.

This is what was done by Baudeloque in one case, where the womb inclined forward and to the right. The os tincæ was situated backward. The waters escaped, and the head advanced towards the bottom of the pelvis, included in a portion of the uterus. The whole of the spherical tumour, which presented itself, could be felt with the finger; but, no opening was distinguishable; and the swelling might also be seen, on separating the labia from each other, and opening the entrance of the vagina. It became necessary to keep the patient continually in bed, and to have the finger incessantly introduced; but, she was not sufficiently docile to submit to such treatment. Fortunately, the unexpected appearance of two officers of justice, forty-eight hours after the commencement of the labour, had the effect of making her more manageable. It was time for her to become so; for, the uterus had now become tense, red, and painful. The abdomen was also so tender, that it could scarcely bear the contact of the clothes. Febrile symptoms had begun, and the ideas were beginning to be confused. Baudeloque made her lie down; and he pressed, with one hand, on the abdomen, for the purpose of raising the uterus, while, with the other, he pushed the head a little way back, in order that he might reach the os tincæ, which he now brought with his finger toward the centre of the pelvis, and kept there for some time. The efforts of the patient being thus encouraged, she was delivered in about a quarter of an hour. The infant was of a thriving description, and the case had a most favourable termination.

When the obliquity of the uterus is such, that the os tincæ cannot be found, and the mother and fetus are both in danger of perishing, it is the duty of the practitioner to open the portion of the womb, that projects towards the vulva. Lauverjat met with a case of this description in his practice. A woman, pregnant with her first child, suffered such extreme pain in her labour, that Lauverjat was solicitous to ascertain the real state of things. He was surprised to find the vulva completely occupied by a body, which even protruded externally, and yielded to the pressure of the fingers, except during the labour-pains. In examining this tumour, he could only find at its circumference a cul-de-sac, half an inch deep, without any aperture, through which the child could pass. Other practitioners, who were consulted about this extraordinary case, were also anxious to learn what had happened. They found in the tumour a laceration, which only affected a part of the thickness of its parietes. This laceration was deemed the proper place for making an incision The operation having been done, the finger was passed into the cavity, in which the child was contained. A large quantity of turbid fluid was discharged. The child presented, and passed through the opening, which had been formed, producing a trivial laceration on the right side. Lauverjat, having passed his hand into the uterus, was unable to find either the os tincæ, or the cervix. No particular indisposition ensued, and the lochia were discharged through the wound, which gradually closed. In the course of two months, the os tincæ and neck of the uterus, were in their natural position again. (*Lauverjat Nouvelle Methode de Pratiquer l'Operation Cesarienne, Paris,* 1788.)

When the case is a scirrhous induration of the cervix uteri, or a laceration of the parietes of this viscus, at the place, where it projects into the vagina, the vaginal Cæsarean Operation appears to be attended with no difficulty. It is performed with a blunt-pointed bistoury, the blade of which is wrapped round with lint, to within an inch of the point. The instrument is to be introduced, on the index finger, into the opening presented by the uterus, and the aperture is to be properly enlarged, from within outwards, in various directions. But when the scirrhous hardness of the cervix presents no opening at all, or when the part of the uterus projecting in the vagina is entire, the incision should be made from without inwards, with the same kind of knife. Too much caution cannot be used in introducing the instrument, in order that no injury may be done to the child, which lies directly beyond the substance, which is to be divided. No general direction can here be offered, except that of proceeding slowly, and of keeping the index finger extended along the back of the knife, so that it may be immediately known, when the instrument has cut through the substance of the womb, into the cavity of which the finger ought to pass as soon as the knife. If it should be necessary to extend, or multiply the incisions, the cutting instrument should be regulated, in a similar manner, with the same finger. The cervix uteri having been divided, the expulsion of the child is either to be left to nature, or to be promoted by the ordinary means. The operation, that has been described, requires no dressings. However, if the bleeding should prove troublesome, we are recommended to apply to the incision a dossil of lint, wet with vinegar, or spirit of wine. (See *Sabatier's Médecine Opératoire, Tom.* 1.)

### ABDOMINAL CÆSAREAN OPERATION.

This is a far more serious operation, than that which we have just now been treating of, and it is the proceeding, to which the term Cæsarean Operation is more particularly applied.

There are three cases, in which this operation may be necessary. 1. When the fœtus is alive, and the mother dead, either in labour, or the last two months of pregnancy. 2. When the fœtus is dead, but cannot be delivered in the usual way, from the deformity of the mother, or the disproportionate size of the child. 3. When both the mother and child are living, but delivery cannot take place from the same causes, as in the second instance.

Both the mother and child, if accounts can be credited, have often lived after the Cæsarean Operation, and the mother even borne children afterwards. Heister gives a relation of such success, in his Institutes of Surgery, cap. 113. See also *Mem. de l'Acad. de Chirurgie, Tom.* 1, *p.* 623, *Tom.* 2, *p.* 308, *in 4to. Edinb. Med. Essays, Vol.* 5, *art.* 37, 38, *and Edinb. Med. and Surgical Journal, Vol.* 4. *p.* 179.

In England, the Cæsarean operation has almost always failed. Mr. James

Barlow, of Chorley, Lancashire, succeeded, however, in taking a fœtus out of the uterus by this bold proceeding, and the mother was perfectly restored to health. (See *Haighton's Enquiry concerning the true and spurious Cæsarean operation, and Barlow's account in the Med. Reports and Researches,* 1798.)

This is the only woman, who in this country has had the good fortune to survive the Cæsarean operation, though it is said, that there are eighteen examples recorded, in which it has been performed in Great Britain. Ten of the children, however, are stated to have been saved. On the continent, the practice has proved infinitely more successful; for, of 231 cases of this operation, to be found in the records of medicine, 139 are said to have terminated successfully. (*Kellie, in Edinb. Med. and Surgical Journal, Vol.* 8, *p.* 17.)

When the fœtus is contained in the womb, and cannot be expelled, by reason of the invincible obstacles already mentioned, the Cæsarean operation should be practised, before the mother, and fœtus, both perish from the violence of the pains, hemorrhage, convulsions, &c.

For this purpose, it is necessary to make an extensive incision in the integuments of the abdomen, and in the uterus. Some have thought, that cutting the parietes of the belly was mortal, while others have believed a wound of the uterus to be so. Hence, such persons have condemned the operation on the principle, that religious reasons do not authorize taking one life to save another. All the opponents of the Cæsarean operation fear the hemorrhage, which, they say, must follow. Indeed, if the uterus were not to contract sufficiently, when the fœtus and after-birth have come away, the bleeding would really be perilous. But when, by means of the Cæsarean operation, the fœtus is extracted, together with the placenta and membranes, the uterus will then contract, just as it does after a natural labour. Besides, even when the mother is alive, the operation is not commonly done, till the uterus evinces a propensity to deliver itself, and begins to contract. The womb being delivered of its contents, the incision becomes closed, the vessels obliterated, and there is no fear of hemorrhage. The wound must also make so irritable an organ more disposed to contract; but, whatever arguments may be adduced, it is enough to say in this case: *Artem experientia fecit, exemplo monstrante viam.* Rousset, in 1581, published a work, in French, entitled, *Hystérotomie, ou l'Accouchement Césarien.* This book, in 1601, was translated into Latin, and enlarged with an appendix by the celebrated Bauhin. Even then, the practice of the Cæsarean operation on the living mother had its defenders. Bauhin relates that, in the year 1500, a sow-gelder performed the Cæsarean operation on his wife, *tam feliciter, ut ea posteà gemellos et quatuor adhuc infantes enixa fuerit.* This is said to be the first instance, in which the operation was ever done on the living mother with success. Many other cases were afterwards collected, and published.

The possibility of operating successfully on the living mother has been demonstrated, with so much perspicuity and accuracy, by M. Simon, in *Tom.* 1, *de l'Acad. de Chirurgie, in* 4*to.* that there cannot be a doubt of the thing having been frequently practised with success. Here we are presented with a collection of sixty-four Cæsarean operations, more than a half of which had been done on thirteen women. Some of these had undergone the operation once, or twice; others five or six times. There was one woman in particular, who had undergone it seven times, and always with success. This seems to prove, notwithstanding all assertions to the contrary, that the operation, for the most part, succeeds. But, if the life of the mother should not invariably be preserved, the Cæsarean operation ought not to be rejected on this account; it ought always to be done, when relief cannot be obtained by other means; just as amputation and lithotomy are practised, though they are not constantly followed by success. Would any thing be more cruel, than to abandon a mother and her child, and leave them to perish, while there is any hope of saving them both? It is true, that when a pregnant woman dies of any inward disorder, and not from the pains, and efforts of labour, the fœtus is sometimes still alive in the uterus; but, in cases of death, after difficult labours, and the great efforts, made by the uterus to overcome the obstacles to parturition, the fœtus is generally dead; and the operation therefore is less likely to be availing. (See *Bertrandi Traité des Opérations de Chirurgie, Chap.* 5.)

It is the opinion of the best writers upon this subject, that whenever a woman dies, at all advanced in pregnancy, the performance of the Cæsarean operation is highly proper. Experience has proved, that when the fœtus has not attained the period, at which parturition commonly happens, it will sometimes survive the operation a considerable time, and that, when it is full grown, its life may be most happily preserved. Although instances are cited, in which the fœtus in utero has been found alive upwards of four and twenty hours after the death of the mother, little stress should be laid on such prodigies. The operation ought to be done without any delay. Even then, we are not certain of saving the infant's life. The greater number of fœtuses perish at the same time as the mother, and from the same causes. If the mother should happen to die in labour, and the neck of the uterus were sufficiently dilated, or disposed to be so, an attempt should be made to accomplish delivery in the ordinary way; for, examples have occurred, in which, women, supposed to be dead in this circumstance, were in reality alive. Hence, we find, that the senate of Venice formerly enacted a law, by which practitioners were liable to punishment, in case they neglected to operate with as much caution on a pregnant woman, supposed to be dead, as on the living subject. (*Richerand Nosographie Chirurgicale, Tom. 4, p.* 395, *Edit.* 2.) In the Journal de Savans de Janvier, 1749, the following case, confirming the propriety of such caution, was inserted by M. Rigaudeaux, surgeon to the Military Hospital at Douay. This practitioner, having been sent for to a woman, to whose residence he was unable to proceed, till two hours after her apparent death, he had the sheet, with which she was covered, removed, and perceiving that the body retained its suppleness and warmth, he tried whether the fœtus could not be extracted in the ordinary way, which was easily effected as soon as the feet were got hold of. The first endeavours to save the child, were very unpromising; but, after a few hours, they had the desired effect. As the woman continued in the same state, five hours afterwards, Rigaudeaux recommended, that she might not be buried, before her limbs were quite cold and stiff. He afterwards had the satisfaction to learn that she was also restored to life. This remarkable case happened on the 8th of June, 1745, and both the mother and child were living, at the period, when Rigaudeaux published the observation.

Supposing, however, delivery in the ordinary manner to be impracticable, at all events, the Cæsarean operation ought to be performed, with the same cautions, as if the mother were alive, only one incision being made for the purpose of opening the uterus.

Almost all the insurmountable obstacles to delivery originate from the bad conformation of the pelvis, which depends upon rachitis; though it is not an invariable consequence of it, since there are women, extremely deformed, in whom no imperfection of the pelvis exists, while it prevails in others, whose shape is but trivially disfigured. An examination of the dimensions of the pelvis is the right mode of ascertaining, whether there is really such an impediment to parturition. In order that the dimensions may not be an obstacle to delivery, the distance, between the upper edge of the sacrum and the os pubis, ought to be three inches and a half; and the distances, between the tuberosities of the ischium, and between each of these protuberances and the point of the os coccygis, three inches. Women have indeed been known to be delivered, without assistance, although the first of the above distances, was only two inches and a half; but, then the heads of the children were so elongated, that the great diameter was nearly eight inches, while that, which extends from one parietal protuberance to the other, was reduced to two inches five or six lines, and the infants were lifeless. If they are to be born alive, they must be taken out of the womb by the Cæsarean operation; but, the latter proceeding should never be adopted, without a certainty, that they are actually living; for, when dead, they may be extracted in a way, that is attended with much less risk to the mother.

It is not always an easy matter to ascertain with certainty, whether a fœtus in utero, be living, or dead. If it has entirely ceased to move, after being affected with a violent motion, the probability is, that it is no longer alive. But, to be certain, manual examination is necessary, which may be practised in two ways. One consists in pressing upon the uterus, through the parietes of the abdomen. If the child lives, such pressure makes it move, and the motion can be plainly felt, and distinguished. In the other method, one hand is employed in pressing upon the uterus externally, while, with the fingers of the other hand, passed up the vagina, corresponding pressure is also to be made. The uterus is likewise to be allowed to descend as far as possible, in order to induce the fœtus to move. When no decisive indications can be thus obtained, it becomes necessary to rupture the membranes, if they have not already given way, introduce the hand into the uterus, and put a finger into the child's mouth, for the purpose of making it move its tongue. The finger may also be applied to the region of the heart, so as to examine, whether this organ is beating; and the umbilical cord may be touched, in order to ascertain, whether there is still a pulsation in it. When none of these proceedings furnish unequivocal information, the conclusion is, that the child is dead, and its extraction is indicated, unless the narrowness of the parts be such, that the hand cannot be passed into the uterus, in which case, the Cæsarean operation is indispensable.

But, how are we to form a judgment

respecting the dimensions of the pelvis? And how can we know, whether that diameter, which extends from the upper edge of the sacrum to the os pubis, is long enough to allow the passage of the child? The proper conformation of this part is known, by the roundness and equality of the hips, both in the transverse and perpendicular direction; by the projection of the pubes; by the moderate depression of the sacrum; by an extent of four or five inches from the middle of this depression to the bottom of the os coccygis; by an extent of seven or eight inches from the spinous process of the last lumbar vertebra to the highest part of the mons veneris, in a woman moderately fat; and by there being an interspace of eight or nine inches, between the two anterior superior spinous processes of the ossa ilium.

These general calculations, however, are insufficient. In order to acquire more correct opinions, double compasses must be used. The branches of the first being applied to the top of the sacrum, and middle of the mons veneris, three inches are to be deducted from the dimensions, indicated by the instrument; viz. two inches and a half for the thickness of the upper part of the sacrum, (which is said to be constant in subjects of every size,) and half an inch for that of the os pubis. In women, who are exceedingly fat, some lines must also be deducted on this account. Hence, when the total thickness of the pelvis, measured in this direction, is seven inches, there will remain four for the distance from the upper part of the sacrum to the os coccygis, or for the extent of the lesser diameter of the upper aperture of the pelvis.

For taking the measurement internally, a kind of sector was invented by M. Coutouly. It bears a considerable resemblance to the instruments, employed by shoemakers for measuring the feet. It is passed into the vagina, with its two branches approximated, until one arrives opposite the anterior and upper part of the sacrum, when the other is to be drawn outward, so as to be applied to the pubes. The distance, between the branches, is judged of by the graduations on the instrument. This was named by its inventor a pelvimeter. According to M. Sabatier, it is not always easy to place it with accuracy; its employment is attended with some pain; and there are particular cases, in which it cannot be used.

Instead of this contrivance, the celebrated Baudeloque has recommended a means, which seems to be very safe and simple. The index finger of one hand is to be introduced into the vagina to the upper part of the projection of the sacrum. The finger, having the radial edge turned forwards, is then to be inclined anteriorly till it touches the arch of the pubes. The point of contact being then marked with the opposite hand, the length from the point in question to the end of the finger is to be measured. This length, which indicates the distance between the sacrum and the bottom of the symphysis pubis, usually exceeds that of the lesser diameter of the pelvis by about six lines. Baudeloque acknowledges, that this measurement is not exactly accurate; but, he believes, it will do very well, because, unless the narrowness of the pelvis be extreme, two, or three lines hardly make any difference in the facility of parturition.

The pelvis may be everywhere well formed. and yet present an insurmountable obstacle to delivery, in case an exostosis, lessening its dimensions, should exist on one of the bones, which compose this part of the skeleton. Pineau met with a case of this description in a woman, who died undelivered. The tumour originated from one of the ossa pubis. A steatomatous swelling, situated with the head of the child in the upper aperture of the pelvis, might produce the same effect, unless it were detected, and could be pushed out of the way, so as to make room for the fœtus to pass. Baudeloque mentions a swelling of this kind. It was six or seven inches long, and an inch and a half in width. The extremity of it, which was as large as half an hen's egg, had a bony feel, and contained nine well-formed teeth, the rest of the mass being steatomatous. It had descended into the lesser pelvis, below the projection of the sacrum, and a little to one side. It might have been taken for an exostosis of this last bone. The labour pains continued sixty hours, and the propriety of performing the Cæsarean operation was under consideration. Baudeloque was averse to this proceeding. He recommended turning the child, and extracting it by the feet, because he thought, that the pelvis was sufficiently capacious to admit of delivery. The event proved, that it was three inches nine lines, from before backward, and four inches nine lines transversely. The fœtus was soon easily extracted. The assistance of the forceps was necessary to get out the head. The child was still-born. The mother, exhausted with numerous unavailing efforts, only survived between fifty and sixty hours. Baudeloque was of opinion, that a defective regimen also tended to occasion her death.

Among the insurmountable obstacles to delivery may be reckoned such a displacement of the uterus, that this viscus protrudes from the abdomen and forms a hernia. The records of surgery have preserved some examples of this extraordinary occurrence. Twice has the Cæsarean operation been performed, and, in one of the cases, the woman survived so long, that hopes were entertained of her recovery. Indeed, as Sabatier observes, why should not the operation succeed in such a case, where the uterus is only covered by the integuments, and there is no occasion to cut into the abdomen, just as well as other instances, in which it is indispensable to divide the muscles, and open the cavity of the belly? In the other case on record, delivery was effected in the ordinary way, either by raising the abdomen, and keeping it in this position with towels skilfully placed, or by making pressure on the uterus, which had the beneficial effect of making this organ resume its proper situation.

Having shewn the absolute necessity for the Cæsarean operation, under certain circumstances, it remains to consider the proper time for performing it, the requisite preparatory means, and the method of operating.

With regard to the time of operating, practitioners do not agree upon this point; some advising the operation to be done, before the membranes have burst, and the waters been discharged; others, not till afterwards. The arguments, in favor of the first plan, are, the facility with which the uterus may be opened without any risk of injuring the fœtus, and the hope that the viscus will contract with sufficient force to prevent hemorrhage. The advocates for the second mode believe, that, in operating after the discharge of the waters, there is less danger of the uterus falling into a state of relaxation, in consequence of becoming suddenly empty after being fully distended, and that this method does not demand so extensive an incision. Hence, they recommend, as a preliminary step, to open the membranes. Whatever conduct be adopted, it is essential, that the labour should be urgent and unequivocal, that the cervix uteri should be effaced, and that the os tincæ should be sufficiently dilated to allow the lochia to be discharged; but, at the same time, says M. Sabatier, if the operation is not to be done till after the escape of the waters, there ought not to be too much delay, lest the patient's strength should be exhausted, and the violent efforts of labour should bring on an inflammatory state of the parietes of the uterus.

The propriety of emptying the rectum and bladder is so evident, that it is unnecessary to insist upon it. This precaution is more particularly requisite in regard to the latter of these viscera, which has been known to rise so much over the uterus, as to conceal the greater part of it. Baudeloque had occasion to remark this circumstance, in a woman, upon whom he was operating. The bladder ascended above the navel, and presented itself through the whole extent of the opening made in the parietes of the abdomen.

The instruments, dressings, &c. which may be wanted, are two bistouries, one with a convex edge, the other having a probe-point; sponges; basins of cold water acidulated with a little vinegar; long strips of adhesive plaster; needles and ligatures; lint; long and square compresses; a bandage to be applied round the body, with a scapulary, &c.

For the purpose of undergoing the operation, the patient should be placed at the edge of her bed, well supported; her chest and head should be moderately raised; her knees should be somewhat bent, and held by assistants, one of whom ought to be expressly appointed to fix the uterus by making pressure laterally, and from above downward, so as to circumscribe, in some degree, the swelling of the uterus, and prevent the protrusion of the bowels. These things being attended to, the integuments are to be divided with the convex edged bistoury to the extent of at least six inches. The place, and direction of this incision, differ with different operators.

In the most ancient method, it was customary to make the incision between the outer edge of the rectus muscle, and a line, drawn from the anterior superior spinous process of the ilium, to the junction of the bone of the first rib with its cartilage. This cut was begun a little below the umbilicus, and was continued downward as far as an inch above the pubes. After the integuments had been divided, the muscles, aponeuroses, and peritoneum were cut, and the uterus cautiously opened. The left index finger was then introduced into this viscus, the wound of which was dilated by means of the probe-pointed bistoury.

This manner of operating is subject to great inconveniences. The place, where the incision is made, is the situation of muscles, the fibres of which have a different direction, and, on contracting, separate the edges of the wound, and make it gape. The considerable blood vessels, which ramify there, may be the source of perilous bleeding. The bowels can protrude in that situation more readily, than anywhere else. When the position of the uterus is oblique, and when, consequently, the edges of this viscus are turned forward and backward, and its surfaces to the right and left, the incision will be made in one of the lateral portions of the uterus, where the trunks of its blood-vessels are known to be situated, and sometimes even the Fallopian tube and ovary may be cut. The fibres of the uterus are cut transversely, so that the edges of the incision are apt to gape, instead of being in contact. This last circumstance may the more readily permit the lochia to escape into the abdomen, inasmuch as the uterus is cut nearly through its whole length, and there is no cavity, in which they can accumulate, in order to be discharged through the cervix of that organ.

The linea alba has been frequently considered the most eligible place for making the incision. As Sabatier informs us, it was the method adopted by Soleyrès, and Deleurye, and it has the recommendation of Baudeloque, because there are fewer parts to be cut, and, when the uterus is exposed, an incision, parallel to its principal fibres, may be made in its middle part. Soleyrès thought that this plan of operating originated with Platner and Guérin, a surgeon at Crepì en Valois. Platner says; *Incidantur juxta lineam albam, plagâ majore quæ ab umbilico ad ossa pubis ferè descendit, tùm abdominis musculi, tùm peritonæum, ubi tandem vitandum ne violetur arteria epigastrica.* M. Guérin, in his case, made an incision, six inches long, which began a little above the umbilicus, and extended to within an inch and a half of the pubes. He afterwards divided the fat, muscles, and peritoneum, in order to get at the uterus, the anterior part of which was opened, the wound being made rather in the body, than the fundus of that viscus. Deleurye will not admit, that these writers actually divided the linea alba, because they speak of having cut muscles, which in reality do not exist in that situation; and he attributes the honour of the invention to Varoquier, a surgeon of Lisle, in Flanders; but, the method was known to Mauriceau, as we may be convinced of by the following passage, extracted from the chapter, in which be treats of the Cæsarean operation, "*La plupart veulent qu'on incise au côté gauche du ventre; mais l'ouverture sera mieux au milieu entre les muscles droits, car il n'y a en ce lieu, que les tégumens et les muscles à couper.*" Lauverjat, who has made this remark, and cited the Latin edition of Mauriceau, page 247, also observes, that the incision in the linea alba was practised by a cotemporary of La Motte, a circumstance which Sabatier has not been able to ascertain. (*Medecine Operatoire, Tom.* 1.) The following would be the proper manner of operating in the linea alba. The operator should first divide the integuments perpendicularly, so as to expose the linea alba, making the wound about six inches long. An opening should then be carefully made through the aponeurosis, into the abdomen, either at the upper, or lower part, of the linea alba in view. A curved bistoury is then to be introduced into the opening, and the tendon and peritoneum cut from within outward, as far as the extent of the wound in the integuments. The latter cut should be cautiously made, with the crooked bistoury, guided by the forefinger of the left hand, lest any of the intestines should be accidentally injured. The uterus must next be carefully opened, making an incision in it, of the same length, as the preceding wound. The fœtus is to be taken out through the wound, and then the placenta and membranes. In this way, M. Artiste lately operated, so as to save both mother and child. (See *Edinburgh Surgical Journal, Vol.* 4, *p.* 178.)

This mode of operating, as Sabatier observes, gives more hopes of success, than the plan first described; but he argues, that such hopes have not been realised by experience. Though the operation may have been more easy, he contends, that the edges of the wound in the skin, and those of the incision in the uterus, have had no tendency to remain in a state of proximity to each other, because the linea alba is the point, on which all the large muscles of the abdomen principally act, and because the contraction of the uterus invariably takes place from above downwards. Sabatier alleges, the wound in this viscus has been found to incline to one of its sides, for the same reasons, as occur, in operating at one of the sides of the abdomen. He also states, that the incision has been concealed under the integuments of the upper part of the pubes, and that the presence of the bladder hinders the wound from being carried sufficiently far down. Perhaps, says he, a part of these inconveniences, which depend upon the contraction of the uterus, and the return of this organ to its natural state, might be avoided, by extending the incision to its highest part. Baudeloque has advised this plan, with a view of preventing the fatal extravasations in the abdomen, which frequently follow this operation. Sabatier, however, has doubts, whether, in operating in the linea alba, the wound can be carried high enough. Besides, he maintains, that this precaution would not prevent the wound from gaping, nor the greater tendency of the lochia to be extravasated in the abdomen, than to accumulate in the uterus, and be discharged through the os tincæ. (*Médecine Opératoire, Tom.* 1, *p.* 274—275.)

In this country, (where, indeed, the Cæsarean operation has proved most unsuccessful) the linea alba is preferred, I believe, by the majority of practitioners. That the method is not always attended with the formidable objections, urged against it by Sabatier, is quite certain: the case, lately published by Dr. Chisholm, is a decisive proof of this assertion. (See *Edinb. Med. and Surgical Journal, Vol.* 4, *p.* 178, 179.)

There is a third method of performing the abdominal Cæsarean operation. It consists in making a transverse incision, five inches in length, through the parietes of the abdomen, between the rectus muscle and the spine, and in a situation more or less high, according to the more or less elevated position of the uterus. This plan was recommended by Lauverjat, in a publication entitled, "*Nouvelle Méthode de Pratiquer l'Opération Césarienne, Par.* 1, 1788." Lauverjat acknowledges, that the method has been successfully practised by different persons before himself, and, especially, in one instance, which was particularly remarkable, as, in consequence of the first incision having been made too high up, it became necessary to make a second one, which extended obliquely from the other. However, according to Sabatier, Lauverjat has as much merit, as if he had invented the plan, since he has given a better explanation of its advantages, than any of his predecessors.

The side, on which the operation is to be done, is in itself a matter of indifference. But, if the liver or spleen were to project, one ought to avoid it. Also, if the uterus were to incline more towards one side, than the other, it would be proper to operate on that side, where the uterus could be most conveniently got at. The patient being put in a proper position, and held by assistants, and her abdomen kept steady by an attendant, who must apply the palms of his hands to the sides of the uterus, the integuments, muscles, and peritoneum are to be divided, with the usual precautions. The uterus is then to be opened, and the wound in it enlarged in the requisite degree, by means of a probe-pointed bistoury. Should the placenta present itself, care must be taken not to injure it, for fear of opening one of the arteries of this mass, which communicate with the umbilical arteries of the child, or of leaving a portion of it in the uterus; but, it should be separated, in order to facilitate breaking the membranes at its circumference. The child is next to be extracted. This part of the operation is subject to no general rule. Delivery being accomplished, we are recommended to introduce through the vagina anodyne injections, in order to lessen spasm, and wash out the coagula. This method is preferable to that of clearing out the uterus with the hand. Sabatier most properly condemns the plan, formerly advised by Rousset and Ruleau, of passing up the neck of this viscus a bougie for the purpose of washing out the lochia, as well as the absurd proposal of employing a seton to promote their escape. Should the lochia not pass readily outward, we are recommended to introduce the finger occasionally into the cervix uteri, so as to free it from the coagula, which may obstruct it.

Sabatier observes, that nearly all authors, who have spoken of the Cæsarean operation, whether performed at the sides of the abdomen, or in the linea alba, have advised keeping the edges of the wound in the skin, muscles, and peritoneum together, by means of the interrupted, or twisted suture, care being taken to place at the lower part of the incision a tent, in order to prevent adhesion, and leave a free issue for whatever discharge may take place from the abdomen. Others have been content with recommending the use of adhesive plasters and the uniting bandage.

Sabatier condemns sutures as painful and irritating, and he states, that the other means only act upon the skin, without fulfilling the object in view, because the integuments have no fixed point, and the divided muscles tend to contract. Sabatier assures us, that, in the last mode of operating, the edges of the wound may be brought into contact by merely laying the patient upon her side. Besides, he remarks, that there are not many muscular fibres cut, those of the transversalis being only separated from each other. He affirms, that this manner of operating also favours the approximation of the edges of the wound in the uterus, in consequence of this organ contracting most extensively in the perpendicular direction. It is likewise asserted, that, as the uterus has only been opened at its upper part, it affords in its middle and lower portions a large cavity, which does not communicate with the abdomen, and in which the lochia may easily accumulate, and afterwards be discharged by the natural way. The only dressings, advised by Sabatier, are a large pledget, compresses, and a moderately tight bandage round the body. These are to be changed, when soiled with the matter or discharge. In this country, practitioners would not neglect to bring the edges of the wound, as much as possible together, by means of strips of adhesive plaster; for, though they may not act with so much effect in this situation as many others, they undoubtedly assist in promoting the main aim of the surgeon, which is to heal at least all the upper part of the incision, if possible, by the first intention. I have no doubt, there are many, who would be advocates for sutures. In this country, the last method of operating has also been tried.

Mr. Wood, of Manchester, performed the Cæsarean operation, in a case, in which parturition was prevented by deformity of the pelvis. The incision was made nearly in a transverse direction, on the left side of the abdomen, about five inches in length, beginning at the umbilicus. This part was fixed upon, because the nates of the child could be felt there, and it was evident, that no intestine was interposed betwixt the abdominal parietes and the uterus. There was scarcely any effusion of blood, either from the external wound, or from that of the uterus, though the latter was made directly upon the placenta. Instead of dividing the placenta, Mr. Wood introduced his hand betwixt it and the uterus, and, laying hold of one of the child's knees, extracted the fœtus with ease. His hand readily passed betwixt the placenta and uterus; this produced a hemorrhage, but, not in any considerable degree; for, the whole quantity of blood lost did not exceed seven, or eight ounces. After the uterus was emptied, the intestines and omentum protruded at the wound. These having been reduced, the integuments were brought into contact with sutures and adhesive plaster. This operation, however, did not save the woman's life; she died on the fourth day from the time of its being done. (See *Medical and Physical Journal, Vol.* 6.)

### OF OPERATING, WHEN THE FŒTUS IS EXTRA-UTERINE.

Delivery cannot possibly happen in the ordinary way, when the fœtus is situated in the ovaries, or Fallopian tube, or in the cavity of the peritoneum. However, there are many instances recorded of ventral pregnancies, which the mothers have survived, the dead putrified fœtus having been discharged, either out of an abscess, or through the rectum.

Practitioners are occasionally called upon to do a very similar operation to the Cæsarean, when the child has passed into the cavity of the peritoneum, in consequence of the rupture of the uterus. Unfortunately, such an accident is not uncommon, and though the causes of it may not be obvious, nothing is more certain, than that the fœtus itself is entirely passive, and has no share in producing the misfortune. The symptoms, by which the event can be known, are not always easy of comprehension. When, however, the pains have been violent; when the last, after being excessively severe, has been followed by a kind of calm; when the countenance loses its colour, the pulse grows weak, and the extremities become cold and covered with a cold sweat; when the abdomen is generally flattened, and is only partially affected with a swelling, which is known to be occasioned by the fœtus, which either continues to move, or is dead and motionless; when the patient complains of a moderate degree of heat about the belly; and, lastly, when the child shrinks from the touch of the accoucheur; it is manifest that the uterus is lacerated. If the child has passed completely into the abdomen, gastrotomy is the only resource. Should a part of it, however, yet remain in the uterus, it may be extracted, with the aid of the forceps, if the head presents, or by the feet, provided only the upper part of the body be in the abdomen.

Baudeloque quotes three instances of gastrotomy, performed on account of the rupture of the uterus. The first is that inserted by Thibaud Dubois in the Journal de Médecine for May, 1760. Every preparation was made for a natural labour, when, after excessively violent pains about the upper and left part of the uterus, the child disappeared. Thibaud opened the abdomen, though not till some hours after the accident. The infant was dead; but, the mother experienced no ill effects after the operation, except such as are usual after ordinary labours.

The second and third cases were communicated to the French Academy of Surgery in 1775, by Lambron, a surgeon of Orleans. He practised the operation twice, on the same woman, with success. In the first instance, he operated eighteen hours after the rupture of the uterus. The child was dead. An ill-conditioned abscess formed near the wound; but, the patient got quite well in the course of six weeks. She was pregnant again the following year, and the uterus was once more ruptured. Lambron now had recourse to the operation without delay. The child betrayed some signs of life; but, soon died. The mother not only survived; but, afterwards became pregnant again, and had a favourable delivery.

A laceration in the uterus, or the wound, made in this viscus in the Cæsarean operation, may give rise to dangerous and even fatal symptoms of strangulation, if any of the intestines insinuate themselves into the preternatural opening. When such an occurrence happens in the performance of the preceding operation, the intestine must be directly withdrawn and replaced. If the accident were to happen, when the child is extracted the natural way, the bowel is to be pushed back into the abdomen from the uterus. Were the occurrence to take place several days after the operation, Sabatier enquires, what ought to be done? A surgeon is said to have pushed back the intestine from the uterus as late as the third day. Sabatier thinks, that later it could not be done. In this circumstance, Baudeloque advises the operation, suggested by Pigrai, namely, that of opening the abdomen and withdrawing the bowel from the place, in which it is incarcerated. But, there are serious objections to this proceeding. There is no certainty that the intestine is strangulated, and, if it were so, the adhesions, which are soon formed, would frustrate the operator in his design.

Gastrotomy has not only been recommended for cases, where the child has passed into the abdomen through a rupture of the uterus; it has likewise been advised for instances, in which the fœtus has grown in the Fallopian tube, ovary, or cavity of the abdomen. Here, indeed, the operation deserves to be called Cæsarean; for, in addition to the incision of the skin and muscles of the abdomen, it is necessary to open the pouch, in which the child is contained. The instances of conceptions in the Fallopian tube are not uncommon. Those in the ovary, and cavity of the peritoneum, are more rare. Sabatier conjectures, that most of the cases, reported to be of the latter kind, if attentively examined, would have been found to be in reality conceptions in the Fallopian tube.

Extra-uterine conceptions hardly ever arrive at maturity. However, the fœtus, formed in the Fallopian tube, has sometimes been known to attain the term of nine months, and then die, either from the impossibility of its expulsion, or from the insufficiency of the nourishment afforded it. The pouch, in which it was contained, and the neighbouring parts, have then inflamed, and, after becoming connected together by numerous adhesions, have suppurated. The abscess has burst, partly at some point of the circumference of the belly, and, partly, into the rectum; and the dead fœtus has been discharged piecemeal with the matter.

In other examples, the fœtus, instead of giving rise to abscesses, has become ossified, with the enveloping membranes, and continued in this state many years, without any other inconvenience to the patient, than what depended on the size and weight of the tumour within the abdomen.

Most frequently, however, the pouch, containing the fœtus, bursts, about the middle of the ordinary period of gestation, and the child passes into the cavity of the peritoneum. At the same moment, the blood-vessels, ramifying on the parietes of the containing parts, usually pour forth into the abdomen so much blood, that the patients generally die in the space of a few hours. (*See a case by Dr. Clarke in Trans. of a Society for the Improvement of Medical and Chirurgical Knowledge. Also another adverted to by Mr. C. Bell, in Medico-Chirurg. Trans. Vol.* 4, *p.* 340.)

Sabatier acquaints us, that two facts of this kind have fallen under his observation. The women were in the end of the fourth month of pregnancy. Excepting a swelling, which affected only one side of the abdomen, and frequently dragging pains in this cavity, there was no indication of any thing extraordinary. In other respects, the patients were well. They were both, all on a sudden, attacked with extremely acute pains, which lasted two or three hours. A more violent suffering, than the rest, was followed by entire ease. The abdomen subsided, and became as it were flat. An equal moderate warmth diffused itself over this part of the body. The skin lost its colour. Almost continual syncopes occurred. The pulse was feeble and concentrated. The whole body was covered with a cold sweat, and the women died. The rapid course of these symptoms rendered it impossible for Sabatier to be of any assistance. The patients were actually dying, when he was called to them. The examination of their bodies evinced, that the abdomen contained a large quantity of blood; that the children lay on the intestines, connected with the lacerated Fallopian tube by means of the umbilical cord; and that the tube itself, which was strongly contracted, presented no other tumour, except that which depended on the after-birth.

There is nothing, that announces an extra-uterine pregnancy, with sufficient certainty, to justify any positive conclusion, respecting the nature of the case, before the ordinary time of parturition. In many women, the gravid uterus inclines to one side, and numerous pregnant females have dragging pains, which may depend upon other causes. Things, however, are different, when the fœtus has lived to the ordinary period of parturition, and the woman is attacked with labour-pains; because, besides the unequivocal signs of the presence of a child in the abdomen, the womb is empty, and is little changed from its common state. Should we now, asks M. Sabatier, have recourse to the Cæsarean operation, just as if the fœtus were in the womb? Can we be sure, that the pouch, which contains the child, will contract itself, like the uterus, and that the incision, which is in contemplation, will not give rise to a fatal hemorrhage? Would it be easy to separate, and remove the whole of the placenta? How could the discharge, analogous to the lochia, find an outlet, and would not its extravasation in the abdomen, be likely to prove fatal? Sabatier thinks, that the risk, which is to be encountered, is much less, when things are left to nature. The child, indeed, must inevitably perish. It will either give rise to abscesses, with which it will be discharged in fragments, or it will remain for a length of time in the abdomen, without any urgent symptoms. Sabatier also calls our attention to the great precariousness of an infant's life, and expresses his opinion, that, there can be no difficulty in deciding what conduct ought to be adopted. Happily, practitioners are not often placed in circumstances so delicate, and extra-uterine conceptions mostly perish, before the end of the common period of gestation. We have then only to second the efforts of nature; either by promoting suppuration, if it should seem likely to occur; by making a suitable opening, or enlarging one that may have formed spontaneously; by extracting such fragments of the fœtus as present themselves; by breaking the bones, when their large size confines them in the abscess, as M. Littre did in an instance, where the abscess burst into the rectum; and, lastly, by employing suitable injections. (See *Sabatier's Médecine Opératoire, Tom.* 1.)

Govei, p. 401, relates a case of ventral conception, in which instance the Cæsarean operation was done, and the child preserved. A lady, aged 21, had a tumor in the groin, which, was at first supposed to be an epiplocele, but an arterial pulsation was perceptible in it. In about ten weeks, the swelling had become as large as a pound of bread. Govei, solicited by the lady, opened the tumour. He first discovered a sort of membranous sac, whence issued a gallon of a limpid fluid. The sac was dilated, and a male fœtus found, about half a foot long, and large in proportion. It was perfectly alive, and was baptized. After tying the umbilical cord, the placenta was found to be attached to the parts just behind, and near, the abdominal ring; but it was easily separated. Govei does not mention whether the mother survived; but the thing would not be very astonishing, considering the situation of the fœtus. Bertrandi says, he was unacquainted with any other example of the Cæsarean operation being done, in cases of extra-uterine fœtuses, so as to save both the mother and infant. This eminent man condemned operating, in ventral cases, on the ground that the placenta could not be separated from the viscera, to which it might adhere, or, if left behind, it could not be detached, without such inflammation and suppuration, as would be mortal. But if, in addition to such objections, says Bertrandi, the operation has been proposed by many, and practised by none, we may conclude that this depends on the difficulty of judging of such pregnancies, and of the time when the operation should be attempted. He puts out of the question the dilatations, which have been indicated for extracting dead portions of the fœtus, and also Govei's case, who operated without expecting to meet with a fœtus at all. (*Bertrandi Traité des Opérations de Chirurgie, Chap.* 5.)

Whenever the Cæsarean operation, or gastrotomy, has been performed, the practitioner is not merely to endeavour to prevent inflammation, heal the wound, and appease any untoward symptoms, which may arise; he should also prevail upon the mother to suckle the child, in order that the lochia may not be too copious, and, after the wound is healed, she should be advised to wear a bandage, for the purpose of hindering the formation of a ventral hernia, of which, according to surgical writers, there is a considerable risk.

The best sources of information are, *Sabatier's Médecine Opératoire, Tom.* 1. *Recherches sur l'Operation Césarienne par M. Simon, in Mém. de l'Acad. Royale de Chirurgie, Tom.* 3, *p.* 210, *&c. and Tom.* 5, *p.* 317, *&c. Edit. in* 12*mo. Bertrandi Traité des Opérations de Chirurgie, Chap.* 5. *Baudelocque's Traité des Accouchemens. Denman's Introduction to Midwifery. Hull's Defence of the Cæsarean Operation. Haighton's Enquiry concerning the true and spurious Cæsarean Operation. Med. Obs. and Enquiries, Vol.* 4, *p.* 274, *&c. Edinb. Med. and Surgical Journal, Vol.* 4, *p.* 178, *Vol.* 8, *p.* 11. *Richerand's Nosographie Chirurgicale, Tom.* 4, *p.* 381, *&c. Edit.* 2. *Richter's Anfangsgrunde der Wundarzneykunst, Band* 7, *Kap.* 5; *Gottingen,* 1804. *C. Bell in Medico-Chirurg. Trans. Vol.* 4, *p.* 347, *&c.*

CALCULUS. (from *calx*, a limestone.) Any stony, or earthy concretion, formed in various parts of the body, is usually so called, as, for instance, calculi in the ducts of the salivary glands, in cases of ranula; calculi in the kidnies, bladder, urethra, gall-bladder, &c. Many of these last concretions, if we were to judge by their chemical composition, seem to ill deserve the name of calculi, or stones. For an account of, what are commonly called, stones in the bladder, refer to *Urinary Calculi.*

CALCULUS IN THE INTERIOR OF THE EYE. See *Eye, &c.*

CALLUS. *New bone*, or the ossified substance, which serves to join together the ends of a fractured bone.

The old surgeons believed callus to be a mere inorganic concrete, a fluid poured out from the extremities of the ruptured vessels, which was soon hardened into bone. They always described it, as an "exudation of the bony juice," and imagined that it oozed from the ends of broken bones, as gum from trees, sometimes too profusely, sometimes too sparingly. The reunion of broken bones, and the hardening of callus, they compared with the glueing together of two pieces of wood, or the soldering of a broken pot. (*A. Paré.*) The old surgeons also conceived, that callus sometimes flowed into the joints, so as to form a clumsy, prominent protuberance. They imagined, that callus was a juice, which congealed at a determinate period of time, and they therefore had fixed days for undoing the bandages of each particular fracture. They supposed, that its exuberance might be suppressed by a firm and well rolled bandage, and its knobby deformities corrected by pillows and compresses; that it might be softened by frictions and oils, so as to allow the bone to be set anew. All their notions were mechanical; and their absurd doctrines have been the apology for all the contrivers of machines, from Hildanus down to Dr. Aitken and Mr. Gooch.—(*John Bell's Principles of Surgery, Vol.* 1.)

A bone is a well organized part of the living body; that matter, which keeps its earthy parts together, is of a gelatinous nature. The earthy matter, to which a bone owes its firmness, is deposited in the interstices of the gluten, undergoing a continual change and renovation. It is incessantly taken up by the absorbents, and secreted again by the arteries. It is this continual absorption and deposition of earthy matter, which forms the bone at first, and enables it to grow with the growth of the body. It is this unceasing activity of the vessels of a bone, which enables it to renew itself, when it is broken or diseased. In short, it is by various forms of one secreting process, that bone is formed at first, is supported during health, and is renewed on all necessary occasions. Bone is a secretion, originally deposited by the arteries of the bone, which arteries are continually employed in renewing it. Callus is not a concrete juice, deposited merely for filling up the interstices betwixt fractured bones, but it is a regeneration of new and perfect bone, furnished with arteries, veins, and absorbents, by which its earthy matter is continually changed, like that of the contiguous bone. Indeed, there could be no connexion, between the original bone and callus, were the latter only the inorganic concrete, which it was formerly supposed to be.

Notwithstanding the more accurate opinions now entertained, concerning callus, the supposition is still very common, that the slightest motion will destroy a callus, which is about to form. But, continues Mr. John Bell, it is an ignorant fear, proceeding merely from the state of the parts not having been observed; for, when callus forms, the perfect constitution of the bone is restored; the arteries pour out from each end of a broken bone a gelatinous matter; the vessels, by which that gluten is secreted, expand and multiply in it, till they form, betwixt the broken ends, a well organized, and animated mass, ready to begin anew the secretion of bone. Thus, the ends of the bone, when the bony secretion commences, are nearly in the same condition, as soft parts which have recently adhered; and it is only when there is a want of continuity in the vessels, or when a want of energetic action incapacitates them from renewing their secretion, that callus is imperfectly formed. This is the reason, why in scorbutic constitutions, in patients infected with syphilis, in pregnancy, in fever, or in any great disorder of the system, or while the wound of a compound fracture is open, no callus is generated. (*John Bell's Principles of Surgery, Vol.* 1, *p.* 500, 501.)

For some time, the secretion of earthy matter is imperfect; the young bone is soft, flexible, and of an organization suited for all the purposes of bone; but, as yet, delicate and unconfirmed; not a mere concrete, like a crystallization of a salt, which, if interrupted in the moment of forming, will never form; not liable to be discomposed by a slight accident, nor to be entirely destroyed by being even roughly moved, or shaken. Incipient callus is soft, fleshy, and yielding; it is ligamentous in its consistence, so that it is not very easily injured; and, in its organization, it is so perfect, that when it is hurt, or the bony secretion interrupted, the breach soon heals, just as soft parts adhere, and thus the callus becomes again entire, and the process is immediately renewed.

In consequence of the above circumstances, if a limb is broken a second time, when the first fracture is nearly cured, the bone unites more easily, than after the first accident; and when broken a third, and a fourth time, the union is still quicker. In these cases, the limb yields, it bends under the weight of the body, which it cannot support; but, without any snapping or splintering of the bone, and, generally, without any over-shooting of the ends of the bone, and without any crepitation.

Callus is found to be more vascular, than the old bone. Mr. John Bell mentions an instance of a bone, which had been broken twelve years, before he injected it, yet the callus was rendered very singularly red. When a recently formed callus is broken, many of its vessels are ruptured, but some are only elongated, and it rarely happens, that its whole substance is torn. It is easy to conceive, how readily the continuity of the vessels will be renewed in a broken callus, when we reflect on its great vascularity; and the vigorous circulation, excited by the accident, in vessels already accustomed to the secretion of bone. These reasons shew, why a broken, or bent callus, is more speedily united, than a fractured bone. (Many observations on the production of *Callus*, will be found in the article *Fracture.*)

**CALOMEL.** (Submuriate of mercury; hydrargyri submurias, L.P.) Its extensive utility, in numerous surgical diseases, will be conspicuous in an immense proportion, of the articles in this work. When prescribed, as an alterative, it is commonly directed in the dose of a grain or two a day; when ordered as a purgative, from three to ten grains are given; and when directed, with a view of exciting a salivation, from two to four or five grains a day may be exhibited conjoined with opium. Calomel, generally speaking, is not an eligible preparation for curing venereal complaints; because, when the doses exceed a certain quantity, they generally affect the bowels.

**CALX CUM POTASSA.** This is the strong kind of caustic, most commonly employed in surgery. It is chiefly used for making the eschars, when issues are to be formed. This is often necessary in cases of diseased vertebræ, white swellings, morbid hip-joints, &c. (See *Vertebræ.*) This caustic is also sometimes used, though not so often as it was formerly, for opening buboes and other abscesses. Some are in the habit of making it into a paste with soft soap; they cover the part affected with adhesive plaster, in which there is a hole of the size of the eschar intended to be made; and into this aperture they press the paste till it touches the skin. A bandage is then applied to secure the caustic substance in its situation, till the intended effect is produced.

The action of the calx cum potassa, in this way, however, is more inert and tedious, and, perhaps, on this account, more painful upon the whole. Hence, many of the best modern surgeons never adopt this method; but, after covering the surrounding parts with sticking plaster, rub the caustic on the situation, where it is desirable to produce an eschar, till the skin turns brown. The end of the caustic must first be a little moistened.

The calx cum potassa, is commonly employed also for destroying large funguses.

Before the port-wine injection was found to be the best radical cure for the hydrocele, this caustic was mostly used as a means of cure. (See *Hydrocele.*) Mr. Else, in the case alluded to, used to mix the caustic with powdered opium, by which, it is said, though not with much appearance of truth, that the sloughs were made with little, or no pain to the patient.

Some assert that the potassa alone, acts more quickly, than when mixed with quicklime. I have not found this to be the fact, and, after trying both, give the preference to the calx cum potassa.

**CAMOMILE.** (*Chamœmelum.*) The flowers are bitter and aromatic, and employed in surgery in fomentations.

**CAMPHOR,** is used externally, chiefly as a means of exciting the action of the absorbents, and thus dispersing many kinds of swellings, extravasations, indurations, &c. Hence, it is a very common ingredient in liniments. It has also the property of rousing the action of the nerves, and quickening the circulation in parts, on which it is rubbed. For this reason, in paralytic affections, it is sometimes employed.

Perhaps, there is no composition, that has greater power in exciting the absorption of any tumour, or hardness, than camphorated mercurial ointment.

Camphor is often given internally, in delirium, depending on the irritation of local surgical diseases, as we shall have occasion to explain in several parts of this work. It is also a remedy frequently administered in cases of mortification. Some have recommended it, as singularly useful for the relief of stranguries, even those depending on the operation of cantharides. But, although it may occasionally have succeeded, when given with this view, it not only does not always do so, but, it has been known to cause, an opposite effect, sometimes producing great scalding in voiding the urine, and sometimes pains like those of labour. (*Medical Transactions, Vol.* 1, *p.* 470.)

**CANCER.** (derived from the Latin *cancer*, a crab, to which, a part, affected with cancer, and surrounded with varicose veins, was anciently thought to have some resemblance.) Also called *Carcinoma.*

Practitioners distinguish cancer into two kinds, viz. *occult*, and *ulcerated*, or *open.* No definition can be offered, which is applicable to both, though each of these terms implies the same disease, only in a different stage.

By *occult cancer* is meant a hard, scirrhous tumour, for the most part accompanied with pains, which are lancinating, excessively acute, and recur with more or less frequency. At length, the tumour, breaking, is converted into cancer, strictly so called, or the disease in a state of ulceration.

The occult cancer is also sometimes termed *scirrhus*, on account of its peculiar hardness.

The female breast, and the uterus, are particularly subject to the disease. The breasts of men are but rarely affected. The testes, lips, (especially the lower one of male subjects), the penis, the lachrymal gland and eye, the tongue, the skin, (particularly that of the face), the tonsils, the pylorus, the bladder, rectum, prostate, and a variety of other parts, are recorded by surgical writers as having frequently been the seat of scirrhus and cancer. They seem, however, to have comprehended an immense number of different malignant diseases under one common name, and, in many of the cases called cancerous, there are no vestiges of the true scirrhous structure.

### OF SCIRRHUS, OR CANCER, NOT IN THE ULCERATED STATE.

Mr. Abernethy has given a matchless history of this affection, as it appears in the female breast, where it most frequently occurs, and can be best investigated. Sometimes, says this valuable writer, it condenses the surrounding substance, so as to acquire a capsule; and then it appears, like many sarcomatous tumours, to be a part of new formation. In other cases, the mammary gland seems to be the nidus for the diseased action. The boundaries of the disease cannot be accurately ascertained in the latter case, as the carcinomatous structure, having no distinguishable investment, is confused with the rest of the gland. In either instance, carcinoma begins at a small spot, and extends from thence in all directions, like rays from a centre. This is one feature distinguishing this disease from many others, which, at their first attack, involve a considerable portion, if not the whole, of the part, in which they occur. The progress of carcinoma is more or less quick in different instances. When slow, it is in general unremitting. Mr. Abernethy thinks, that though the disease may be checked, it cannot be made to recede by the treatment, which lessens other swellings. He is not, however, positive on this point; for, surgeons have informed him, that diseases, which eventually proved to be carcinomatous, have been considerably diminished by local treatment. With great deference to Mr. Abernethy, we may be allowed to remark in this place, that every tumour, which ends in cancer, is not from the first of this nature, though it has in the end become so; consequently, it may at first yield to local applications, but will not do so, after the cancerous action has commenced. Hence, Mr. Abernethy's opinion, that a true carcinomatous tumour cannot be partially dispersed, at least, remains unweakened by the fact, that some tumours have at first been lessened by remedies, though they have at last ended in cancer. Sir E. Home's observations fully prove, what indeed every surgeon has long known, that any sort of tumour may ultimately become cancerous.

Without risk of inaccuracy, we may set down the backwardness of a scirrhous swelling to be dispersed, or diminished, as one of its most confirmed features. This obdurate and destructive disease excites the contiguous parts, whatever their nature may be, to enter into the same diseased action. The skin, the cellular substance, the muscles, and the periosteum, all become affected, if they are in the vicinity of cancer. This very striking circumstance distinguishes carcinoma, says Mr. Abernethy, from several other diseases. In what this author calls *medullary sarcoma,* the disease is propagated along the absorbing system; but the parts immediately in contact with the enlarged glands do not assume the same diseased actions. Neither in the *tuberculated* species does the ulceration spread along the skin, but destroys that part only covering the diseased glands. Mr. Abernethy acquaints us, that Mr. Hunter took notice, that a disposition to cancer exists in the surrounding parts, before the actual occurrence of the diseased action. Hence arose the following rule in practice: *That a surgeon ought not to be contented with removing merely the indurated, or actually diseased part, but that he should also take away some portion of the surrounding substance, in which a diseased disposition may probably have been excited.* In consequence of this communication of disease to the contiguous parts, the skin soon becomes indurated, and attached to a carcinomatous tumour, which, in like manner, is fixed to the muscles, or other part, over which it was formed.

As a carcinomatous tumour increases, it generally, though not constantly, becomes unequal upon its surface, so that this inequality has been considered as characteristic of the disease. A lancinating pain is common; but it is not experienced in every case, without exception. It is also a symptom, attending other tumours, which are unlike carcinoma in structure, and it cannot, therefore, be deemed an infallible criterion of the nature of the disease. (*Abernethy.*)

A hard and painful glandular swelling, having a disposition to become cancer, says Richter, is the common, but, inadequate and erroneous definition of scirrhus. The disease is not regularly attended with swelling; sometimes scirrhous parts diminish in size, and shrink. Hardness is not a characteristic property; for, many tumours, which are not scirrhous, are exceedingly indurated. The disease is not always situated in a gland: it oftentimes attacks structures, which cannot be called glandular; and hard glandular swellings are often seen, which do not partake of scirrhus. The disposition to cancer cannot be enumerated among the marks of scirrhus, since it is not discoverable, till carcinoma has actually commenced. Its termination in open cancer, is not an invariable occurrence; and other tumours become cancerous, to which no one would apply the term scirrhus. (*Anfangsgr. der Wundarzn. Band* 1.)

Scientific surgeons ought undoubtedly to have a definite meaning, when they employ the word scirrhus; superficial practitioners do unquestionably use the word most vaguely; and, perhaps, influenced by its etymology, they call an immense number of various morbid indurations scirrhous.

I have always considered scirrhus, as a diseased hardness, in which there is a propensity to cancerous ulceration, and a greater backwardness to recede, than exists in any other kind of diseased hardness, although the skin may occasionally not break during life, and a few scirrhous indurations may have been lessened.

Though Richter states, that this disposition cannot be discovered, till carcinoma has actually taken place; though Burns and Home confirm, that other indurations and tumours may terminate in cancer; though Mr. Abernethy shews, that sarcomatous, and encysted tumours may end in most malignant diseases, and such as merit the name of cancer; yet, it is now well ascertained, that in all these instances, the changes, which precede cancerous ulceration, bear no similitude to the genuine scirrhus.

The puckering of the skin, the dull leaden colour of the integuments, the knotted and uneven feel of the disease, the occasional darting pains in the part, its fixed attachment to the skin above, and muscles beneath, form so striking an assemblage of symptoms, that, when they are all present, there cannot be the smallest doubt, that the tumour is a scirrhus, and that the disease is about to acquire, if it have not already acquired, the power of contaminating the surrounding parts, and the lymphatic glands, to which the absorbents of the diseased part tend.

The truly scirrhous tumour, which is known to be capable of changing into the true open cancer, when allowed to increase in size is known to be hard, heavy, connected with the gland of the breast; and, when moved, the whole gland moves along with it. The structure of a scirrhous tumour in the breast, is different in the various stages of the disease; and a description of the appearances, exhibited in the three principal ones, may give a tolerable idea of what the changes are, which it goes through, previous to its breaking, or becoming, what is termed, an open cancer.

When a section is made of such a tumour, in an early stage, provided the structure can be seen to advantage, it puts on the following appearance: the centre is more compact, harder to the feel, and has a more uniform texture, than the rest of the tumour; and is nearly of the consistence of cartilage. This middle part does not exceed the size of a silver penny; and, from this, in every direction, like rays, are seen ligamentous bands, of a white colour, and very narrow; looking, in the section, like so many extremely irregular lines, passing to the circumference of the tumour, which is blended with the substance of the surrounding gland. In the interstices, between these bands, the substance is different, and becomes less compact towards the outer edge. On a more minute examination, transverse ligamentous bands, of a fainter appearance, form a kind of net-work, in the meshes of which the new-formed substance is inclosed. This structure accords with what Dr. Baillie describes to be the case, in cancerous diseases of the stomach and uterus. (*Home.*)

In a further advanced stage of the tumour, the whole of the diseased part has a more uniform structure; no central point can be distinguished; the external edge is more defined, and distinct from the surrounding gland; and the ligamentous bands, in different directions, are very apparent, but do not follow any course, that can be traced. (*Home.*)

When the tumour has advanced to what may be called cancerous suppuration, which, however, does not always happen in the centre, before it has approached the skin, and formed an external sore; it then exhibits an appearance totally different from what has been described. In the centre is a small irregular cavity, filled with a bloody fluid, the edges of which are ulcerated, jagged, and spongy. Beyond these, there is a radiated appearance of ligamentous bands, diverging towards the circumference; but, the tumour, near the circumference, is more compact, and is made up of distinct portions, each of which has a centre, surrounded by ligamentous bands, in concentric circles.

In some instances, the scirrhus has no appearance of suppuration, or ulceration, in the centre, but consists of a cyst, filled with a transparent fluid, and a fungous excrescence, projecting into this cavity, the lining of which is smooth and polished. When a large hydatid of this kind occurs, a number of very small ones have been found, in different parts of the same tumour; and, in other cases, there are many very small ones, of the size of pins' heads, without a large one. These hydatids are certainly, by no means, sufficiently frequent in their occurrence to admit of their forming any part of the character of a cancerous tumour. (*Home's Observations on Cancer.*)

In the fourth chapter of this work, the author relates two cases of hydatids found in the breast. In the first, the contents of the cyst were bloody serum; in the second, a clear fluid. These two cases of simple hydatids in the breast, unconnected with any other diseased alteration of structure, led Sir E. Home to consider the hydatids sometimes found in cancerous breasts: and, he believes, that such hydatids are no part of the poisonous disease, but accidental complaints superadded to it; and, since such hydatids do occur in the natural state of the glands, they are much more likely to do so in disease. (*Home.*)

Sir E. Home endeavours to define his conception of a cancer, as follows: As cancer is a term, too indiscriminately applied to many local diseases for which we have no remedy, though they differ very much among themselves, it becomes necessary to state what the complaints are, which I include under this denomination. The present observations, respecting cancer, apply only to those diseased appearances, which are capable of contaminating other parts, either by direct communication, or through the medium of the absorbents; and when they approach the skin, produce in it small tumours of their own nature, by a mode of contamination, with which we are at present unacquainted.

There is a disease, by which parts of a glandular structure are very frequently attacked, particularly the os tincæ, the alæ of the nose, the lips, and the glans penis. This has been called cancer, but differs from the species, of which we are now treating, in not contaminating the neighbouring parts, with which it is in contact; and neither affecting the absorbent glands, nor the skin at a distance from it. It is, properly speaking, an eating sore, which is uniformly progressive; whereas, in cancer, after the sore has made some progress, a ridge is formed upon the margin, and the ulceration no longer takes that direction. It also differs from a cancer, in admitting of a cure, in many instances, and under different modes of treatment.

From the facts which have been stated, (in Sir E. Home's case) it appears, that cancer is a disease, which is local in its origin. In this respect, the cases (alluded to) only confirm an opinion very generally received.

Sir E. Home endeavours to establish a second point, that cancer is not a disease, which immediately takes place in a healthy part of the body; but one, for the production of which it is necessary, that the part should have undergone some previous change, connected with the disease. In proof of this, Sir E. Home adduces the two first cases in his work, and the innumerable instances, in which a pimple, small tumour, or wart upon the nose, cheek, or prepuce, after remaining for ten, fifteen, or thirty years, without producing the smallest inconvenience; but, at the age of sixty or seventy, upon being cut in shaving, bruised by any accidental violence, or otherwise injured, assumes a cancerous disposition.

All the cases of induration of the gland of the breast, or of indolent tumours in it, which have continued for years, without producing any symptom, and, after being irritated by accidental violence, have assumed a new disposition, and become cancerous, admit of the same explanation; and are adduced as so many proofs of the truth of this latter position. (*Home.*)

### DISTINGUISHING CHARACTERS OF SCIRRHUS.

A scirrhous induration seldom acquires the magnitude, to which almost all other tumours are liable to grow, when no steps are taken to retard their growth. Many scirrhi are certainly attended even with a diminution, or shrunk state, of the part affected.

Scirrhi are generally more fixed, and less moveable, than other sorts of tumours; especially, when the latter have never been in a state of inflammation.

With the exception of the fungus hæmatoides, other diseases do not involve in their ravages indiscriminately every kind of structure, skin, muscle, cellular substance, &c. and the integuments seldom become affected, before the distention, produced by the size of such swellings, becomes very considerable. In scirrhous cases, the skin soon becomes contaminated, discoloured, and puckered.

Some few tumours may be harder, and heavier, than a few scirrhous ones; but, the reverse, is commonly the case.

As other indurations, and tumours, may assume the cancerous action, and even end in cancerous ulceration; and, as some true scirrhi, when not irritated by improper treatment, may continue stationary for years; the occurrence of actual carcinoma cannot prove, that the preceding state was that of scirrhus. The only criterion of the latter disease is deduced from the assemblage of characters already specified; for, except the peculiar puckering, and speedy leaden discolouration of the skin, no other appearances, considered separately, form any line of discrimination.

The white ligamentous bands, around a scirrhus, is a very characteristic symptom; but, these cannot be detected, till the disease has been removed. Hence, how manifestly prudent it must be to take away a considerable portion of the substance surrounding a scirrhous tumour! Were any of these white bands left, the disease would inevitably recur.

### OF CANCER IN THE STATE OF ULCERATION.

The diseased skin, covering a carcinomatous tumour, generally ulcerates, before the tumour has attained any great magnitude; a large chasm is then produced in its substance, partly by a sloughing, and partly by an ulcerating process. Sometimes, when cells, contained in the tumour, are by this means laid open, their contents, which are a pulpy matter of different degrees of consistence, and various colours, fall out, and an excoriating ichor issues from their sides. This discharge takes place with a celerity, which would almost induce belief, that it can hardly result from the process of secretion. When the diseased actions have, as it were, exhausted themselves, an attempt at reparation appears to take place, similar to that which occurs in healthy parts. New flesh is formed, constituting a fungus of peculiar hardness, as it partakes of the diseased actions, by which it was produced. This diseased fungus occasionally even cicatrizes. But, though the actions of the disease are thus mitigated; though they may be for some time indolent and stationary; they never cease, nor does the part ever become healthy.

In the mean while, the disease extends through the medium of the absorbing vessels. Their glands become affected, at a considerable distance from the original tumour. The progress of carcinoma, in an absorbent gland, is the same as that, which has been already described. The disease is communicated from one gland to another, so that after all the axillary glands are affected, those, which lie under the collar bone, at the lower part of the neck, and upper part of the chest, become disordered. Occasionally, a gland, or two, become diseased higher up in the neck, and apparently out of the course which the absorbed fluids would take. As the disease continues, the absorbent glands, in the course of the internal mammary vessels, become affected. In the advanced stage of carcinoma, a number of small tumours, of similar structure to the original disease, form at some distance, so as to make a kind of irregular circle round it.

The strongest constitutions now sink under the pain and irritation, which the disease creates, aggravated by the obstruction, which it occasions to the function of absorption, in those parts, to which the vessels leading to the diseased glands belong. Towards the conclusion of the disease, the patient is generally affected with difficulty of breathing, and a cough. (*Abernethy.*)

The edges of a cancerous ulcer are hard, ragged, and unequal, very painful, and reversed in different ways, being sometimes turned upwards and backwards, and, on other occasions, inwards. The whole surface of the sore is commonly unequal: in some parts, there are considerable risings, whilst, in others, there are deep excavations. The discharge, for the most part, is a thin, dark coloured, fetid ichor; and is often possessed of such a degree of acrimony, as to excoriate, and even destroy, the neighbouring parts. In the more advanced stages of the disease, a good deal of blood is often lost from the ulcerated vessels. A burning heat is universally felt over the ulcerated surface; and, this is the most tormenting symptom, that attends the disorder. Those shooting, lancinating pains, which are generally very distressing in the occult state of the complaint, become now a great deal more so. Notwithstanding that cancerous diseases are not always situated in glandular parts, yet the situation of such sores affords some assistance in the diagnosis; for, six times as many cancerous affections occur in the lips, and female breasts, as in all the rest of the body together. (*B. Bell.*)

Concerning the peculiar state of the parts in cancer, or the proximate cause, many opinions have prevailed. Until lately, the melancholic humour was supposed to be the fluid, which was obstructed, and accumulated, in consequence of which it fermented, and produced a burning ulcer; and whatever promoted the generation of this humour, was currently admitted as a remote cause of cancer.

"Women," says Paré, "are more subject to scirrhus, than men; because their liver is warmer, and their spleen, being weaker, is less able to purge the blood of choler." Grief and chagrin, by promoting the formation of this fiery fluid, were accordingly considered by Heister as very apt to induce the "cancerous diathesis;" and he adds by way of corollary, "old maids, and women, who do not breed, are very subject to cancer in the breast." Some thought that the obstructed humour became charged with an acid, (*Dionis*) and that this produced ulceration. Others conjectured, that by an adustion, or over-concoction, it grew sharp and burning. Wiseman thought it more probable, that it might become arsenical. These changes were almost universally believed to depend upon the previous stagnation, in consequence of obstruction; and this leading point has uniformly been insisted upon by every preceding author, whatever may be his particular notion, with regard to the nature of the obstructed fluid, whether bile, blood, or lymph. Even Mr. B. Bell insists fully on the cause of cancer being a mechanical obstruction. Some have asserted, that they have detected little worms in the parts, which, eating them up, produced all the mischief attendant on cancer; and that to their introduction the disease was owing. Others have ridiculously assigned a little wolf in the part, as the cause of the disease! Strange as this doctrine, of living creatures producing cancer, may appear, it is nevertheless adopted by Dr. Adams. (*Observations on Morbid Poisons.*) When hydatids find their way into a solid substance, the consequence, in his opinion, will be cancer; and the success of an operation will, he conjectures, depend, in a great measure, upon these animals being confined in a common cyst, for then they may be all removed; whereas, if they be unconnected, some of the smaller ones may be allowed to remain. From the surface of the cyst, which contains the animal, a fungus shoots out, and thus acts, as a barrier, between it and the skin; or, if the animal have been in the stomach, it separates it from the coats of that viscus, "preventing suppuration in the one instance, and absorption in the other." This suppuration, and "disposition to fungate, before the skin is broken," is, (continues Mr. Burns) if I understand him, produced by the death of the animal; for, says Dr. Adams, "if hydatids possess the principle of vitality, during their transparent state, and their opacity is the effect of the loss of that principle, would they not, in the latter stage, stimulate the part, in which they are situated, to suppuration, as we find the case with the guinea-worm, when dead?"

Concerning the manner, in which these animals produce the symptoms of cancer, we are told, that "this enlargement of a foreign body in a solid substance, and so extremely sensible, as the breast, cannot but be attended with intense pain, and frequent inflammation." A doctrine not far removed, says Mr. Burns, from that taught in the humoral schools, which maintained, that the coagulation, and inspissation of the fluids, distended the follicles of the glands, producing many cavities, and much pain. (See *Burns on Inflammation, Vol. II.*)

We have already stated, that, though hydatids are occasionally found in cancerous tumours, they are not found often enough to make any part of the character of the disease; and they are met with, in cases, in which there is not the least vestige of such disorder.

After cancer had continued some time, it was believed, that the matter was absorbed into the blood, and that all the humours were speedily assimilated. Hence, was explained the fatal and rapid progress of relapses, after an apparent cure. The only effect of absorption, however, is on the lymphatic glands, which intervene betwixt the sore and the heart; for, beyond these, the absorbed matter is changed in its nature and properties. (*Burns.*)

In many instances, cancer is evidently produced by the same causes, which are capable of producing simple inflammation. It is, however, a general opinion, that cancer arises frequently from some unknown and mysterious cause, which we cannot detect, and which, therefore, has been resolved into some constitutional taint, or cancerous ferment. But, so far as we know, the constitution is perfectly healthy, in the commencement of this disease; nor is there the smallest proof, that it resembles scrophula, in depending on any peculiarity of constitution, before the causes operate. Blows, bruises, &c. may give rise to cancer; but, in many instances, there is no evident local cause acting directly on the part. In the breast, cancer frequently commences, without the interference of any topical agent. There is always, however, in these cases, an irregularity, or disappearance of the menses; and the affection of the mamma seems to depend on sympathy between it and the uterus. Certain it is, that cancer is very frequent about the time of life, when the menstrual discharge ceases.

Cancerous diseases are undoubtedly most common in elderly persons; but, no age is exempted from this disease. Mr. Burns mentions his having seen it distinctly marked, and attended with a fatal event, in children of five years old: he mentions two instances of the eye being affected in such subjects, though from the late observations of Mr. Wardrop, we may now reasonably suspect, that these examples were really cases of the fungus hæmatodes.

### TREATMENT OF CANCER.

Some have supposed cancers to be a general disorder of the system; while others have regarded them merely as a local affection. This is a point of much importance in practice; for, if cancers are originally only local affections, no objection can be made to extirpating them. They who think, that cancer is a constitutional disease, regard the operation as useless, perhaps hurtful, inasmuch as it may convert a scirrhus into an open cancer, or make the affection occur in some other part.

The best practitioners of the present day, however, have rejected the doctrine of cancer depending on constitutional causes; and, we have stated Sir E. Home's sentiments, in opposition to the opinion. When cancer breaks out again, in the same part, after the performance of an operation, it is often owing to some portion of the disease having been blameably left behind, or to the operation having been put off too long. How likely it is, that some of the cancerous mischief may be left unremoved by the operator, is obvious, on considering the manner, in which the white bands, resembling ligament, shoot into the surrounding fat; and that, even the fibres of the muscles, beneath a cancerous disease, are frequently affected. At the same time, it must be allowed, that the disease is sometimes, to all appearances, so freely and completely removed, that its recurrence must perhaps be imputed to the continued operation of the same unknown cause, which originally produced the first cancerous mischief.

Until late years, the accounts given of the results of operations for cancers, were so unpromising, that they must have deterred many patients from undergoing a timely operation; which, for cancerous complaints, is the only remedy to be depended on, with which we are as yet acquainted. As Mr. B. Bell remarks, the great authority of Dr. Alexander Monro must have had no inconsiderable influence even with practitioners, in making them much more backward in undertaking the extirpation of cancers, than they otherwise would probably have been. "Of near sixty cancers," says he, "which I have been present at the extirpation of, only four patients remained free of the disease, at the end of two years: three of these lucky people had occult cancers in the breast, and the fourth had an ulcerated cancer on the lip." (*Edinb. Med. Essays, Vol.* 5.) Dr. Monro also observes, that, in those, in whom he saw the disease relapse, it was always more violent, and made a quicker progress, than it commonly did in others, on whom no operation had been performed. Hence, he questions, "whether ought cancerous tumours to be extirpated, or ought the palliative method only to be followed?" and, upon the whole, he concludes against their extirpation, except in such as are of the occult kind, in young healthy people, and that have been occasioned by bruises, or some other external causes.

More modern experience, however, has afforded a very different result, and given ample encouragement to the early performance of an operation, and even to making an attempt to cut away the disease, in every instance, both of the occult, and ulcerated kind, when such a measure can be so executed, as not to leave a particle of the cancerous mischief behind.

Mr. Hill, in 1772, published some valuable remarks on the present subject. At this period, he had extirpated from different parts of the body eighty-eight genuine cancers, which were all ulcerated, except four; and all the patients, except two, recovered of the operation. Of the first forty-five cases, only one proved unsuccessful; in three more, the cancer broke out again in different parts; and, in a fifth, there were threatenings of some tumours, at a distance from the original disease. These tumours, however, did not appear, till three years after the operation; and the woman was carried off by a fever, before they had made any progress. All the rest of the forty-five continued well, as long as they lived; or are so, says Mr. Hill, at this day. One of them survived the operation above thirty years; and, fifteen were then alive, although the last of them was cured in March 1761.

Of the next thirty-three, one lived only four months; and, in five more, the cancer broke out afresh, after having been once healed. The reason, why, out of forty-five cases, only four or five proved unsuccessful, and six, out of thirty-three, was as follows: "The extraordinary success, I met with, (says Mr. Hill,) made cancerous patients resort to me from all corners of the country, several of whom, after delaying till there was little probability of a cure by extirpation, or any other means, forced me to perform the operation, contrary both to my judgment and inclination."

Upon a survey in April 1764, made with a view to publication, the numbers stood thus: Total cured, of different ages from eighty downwards, sixty-three; of whom there were then living thirty-nine. In twenty-eight of that number, the operation had been performed more than two years before; and, in eleven, it had been done in the course of the last two years. So that, upon the whole, after thirty years' practice, thirty-nine, of sixty-three patients, were alive and sound; which gives Mr. Hill occasion to observe, that the different patients lived as long after the extirpation of the cancers, as according to the bills of mortality, they would have done, had they never had any cancers, or undergone any operation.

The remaining twenty-five, which complete the eighty-eight, were cured since the year 1764. Twenty-two of these had been cured, at least, two years; and some of them, it may be remarked, were seventy, and one ninety years old.

In the year 1770, the sum of the whole stood thus: Of eighty-eight cancers, extirpated at least two years before; not cured, two; broke out afresh, nine; threatened with a relapse, one; in all, twelve, which is less than a seventh part of the whole number. At that time, there were about forty patients alive and sound, whose cancers had been extirpated above two years before.

Mr. B. Bell, who was present at many of these cases, bears witness to Mr. Hill's accuracy; and, the former very judiciously states, that, "from these and many other authenticated facts, which, if necessary, might be adduced of the success, attending the extirpation of cancers, there is, it is presumed, very great reason, for considering the disease, in general, as a local complaint, not originally connected with any disorder of the system; and that a general cancerous taint seldom, or perhaps never, occurs, but, in consequence of the cancerous virus being absorbed into the constitution from some local affection. This, in every case of real cancer, or rather in such scirrhosities, as, from their nature, are known generally to terminate in cancer, should certainly determine us to have recourse to extirpation as early as possible; and, if this were done soon after the appearance of such affections, or before the formation of matter takes place, their return would probably be a very rare occurrence." (*System of Surgery, Vol.* 7.)

## MEDICINES AND PLANS, WHICH HAVE BEEN TRIED, FOR THE CURE OF SCIRRHUS AND CANCER.

It is a contested point, whether a truly cancerous disease is susceptible of any process, by which a spontaneous cure can be effected. It appears certain, however, that a violent inflammation, ending in sloughing, may sometimes accomplish an entire separation of a cancerous affection, and that the sore, left behind, may then heal. Facts, confirming this observation, are occasionally exemplified in cases, where caustic is used, and accidental inflammations have led to the same fortunate result, as we may be convinced of by examples recorded by Home, Richerand, &c. The latter writer, adverting to the effort, which nature sometimes makes to rid herself of the disease, on the inflammation and bursting of the tumour, takes the opportunity to relate the following case. A woman, aged forty-eight, of a strong constitution, was admitted into the hospital of St. Louis, with a cancerous tumour of the right breast. The swelling, after becoming softer, and affected with lancinating pains, was attacked with an inflammation, which extended to the skin of the part, and all the adjacent cellular membrane. The whole of the swelling mortified, and was detached. A large sore, of healthy appearance, remained after this loss of substance, and healed in two months. (*Nosographie Chirurgicale, Tom.* 1, *p.* 381, *Edit.* 2.)

In general, however, it must be confessed, that inflammation, attacking a cancerous disease, renders things worse instead of better, and by converting occult cancers into ulcerated ones, hastens the patient's death, or, at all events, renders his cure more difficult, and forbids any attempts, which, on such a principle, might be made for his relief.

Of the general remedies, narcotics, such as cicuta, opium, nightshade, &c. have been employed with most confidence.

Cicuta owed its reputation to the experimenting talent of Storck, who has written several libelli on this plant. According to him, cicuta possesses very evident powers over cancer, and has cured a great many cases; but, in less prejudiced hands, it has been found much less successful; and even in many of the instances, adduced by Baron Storck, of its utility, it is by no means proved, that the disease was really cancer. The public have now, with great reason, very little reliance on this medicine. In cancerous ulceration, Mr. Burns declares, that he never knew cicuta produce even the temporary melioration, which many talk of.

The common way of exhibiting the hemlock is to begin with small doses, and increase them gradually, until they produce vertigo. We may begin with two grains of the extract, or four of the powder, recently prepared, twice, or thrice a day, and the quantity is to be gradually increased. In this way, some patients have at last been able to take an ounce of the extract daily; but, says Mr. Burns, if a much less quantity, than this, produce no good effect, we may consider it as useless to continue a remedy, which, in this dose, must injure the constitution every day that it is continued. On the continent, hemlock has been used in the form of a bath; but, this method is so disagreeable, that few will submit to it.

The belladonna has been much recommended by Lambergen. During its use, he kept the bowels open with clysters, administered every second day. The dose should be, at first, a grain of the dried leaves, made into a pill. This, in the beginning, is to be given in the morning and evening, and afterwards more frequently. The reputation of belladonna has not been supported by much success

The hyocyamus has often been tried in cancerous cases, and was held in great estimation by the ancients. Mr. Burns says, he has employed it occasionally, but with little effect. The dose, with which you may begin, is two grains of the extract.

The aconitum has also been given; and, as it is a very powerful and dangerous narcotic, a quarter of a grain of the extract is generally the dose, at first. The solanum dulcamara, Paris quadrifolia, phytolacca, &c. have been recommended;

but, they are now hardly ever employed; which is a sufficient proof of their inefficacy. Mr. Burns mentions his having tried the hepatized ammonia, without any benefit. Richter has given the laurus cerasus, but with little success. The dose of the distilled water being uncertain, four, or five grains of the fresh leaves may be infused in a little water, as a dose.

The digitalis diminishes vascular action, and may act on scirrhi, like abstinence, bleeding, &c. It has, however, no specific virtue in curing cancerous diseases.

Opium is seldom employed, with an intention of curing cancer, although it probably has just as much power of this kind, as other narcotics, which have been more frequently used. For the purpose of lessening the pain of cancerous diseases, however, opium is very freely employed.

Tonics may sometimes improve the general health; but, as they never produce any effect on the local disease, they are now seldom exhibited.

Mr. Justamond thought arsenic a specific for cancers. Future experience has not, however, altogether confirmed the truth of this opinion, though there are many practitioners, who continue to think highly of the efficacy of this mineral in carcinomatous diseases. Indeed, I am of opinion, that arsenic has greater claims to further trials in these cases, than perhaps any other medicine, that has hitherto been employed. It unquestionably cures numerous ill-looking sores, on the face, lips, and tongue, and is one of the best remedies for noli me tangere. Mr. Hill observes: "Experience has furnished me with some substantial reasons for considering arsenic as a medicine of considerable merit, both with regard to actual cancer and scirrhus, which may one day terminate in that horrible species of ulcer; and although I cannot as yet say it will remove the one, or cure the other, as certainly and safely as mercury commonly does a syphilitic swelling, or open sore, yet, it will, in a great majority of cases, retard the progress of the true scirrhous tumour, and often prevent its becoming cancer. In some, it has appeared to dissipate such swellings completely." (See *Edinb. Med. and Surgical Journal, Vol.* 6, *p.* 58.)

Mercury, in conjunction with decoctions of guaiacum, sarsaparilla, &c. has been recommended; but, as Mr. Burns very justly remarks, no fact is more certainly ascertained, than that mercury always exasperates the disease, especially, when in the ulcerated state.

The cuprum vitriolatum has been tried; but, it has at this day no fame whatever. The same may be said of muriated barytes.

The carbonate (rust) of iron has been extolled, by Mr. Carmichael, for its efficacy in curing cancer. Besides the carbonate of iron, he has prescribed the tartrate of iron and potass, and the phosphate, oxyphosphate, and suboxyphosphate of the metal. Some constitutions can bear these preparations only in small quantities; they affect most patients with constipation, and many with headach and dyspnea. These circumstances, therefore, must be attended to in regulating the dose. The above gentleman has seldom given less than thirty grains, in divided doses, in a day, or exceeded sixty. He prefers the suboxyphosphate for internal use, and states, that it answers best in small doses, frequently repeated. It should be blended with white of egg, have a little pure fixed alkali added, and then be made into pills with powdered liquorice. Aloes is recommended for the removal of costiveness. When half a grain is combined with a pill, containing four grains of carbonate of iron, and taken thrice a day, the constipation will be obviated. When the internal use of iron brings on headach, difficult respiration, a quick, sometimes full pulse, which is also generally, hard and wiry, excessive languor, lassitude, &c. and such symptoms become alarming, the iron is to be left off, and four grains of camphor given, every fifth hour.

At the same time, that preparations of iron were internally administered, Mr. Carmichael has employed externally, for ulcerated cancers, the carbonate, phosphate, oxyphosphate, and arseniate of iron, blended with water, to the consistence of a thin paste, which was applied once every twenty-four hours. To occult cancers, the same gentleman has applied a solution of the sulphate of iron, ℥j to lbj of water. The acetite of iron, diluted with eight or ten times its weight of water, was also used. These lotions were put on the part affected by means of folded linen, wet in them, and covered with a piece of oiled silk to prevent injury of the clothes. (See An *Essay on the effects of the Carbonate and other preparations of iron upon Cancer, &c. by Richard Carmichael.*)

Many remedies have acquired celebrity in cases of cancer, because very bad and malignant diseases, only supposed to be cancers, have got well, under their use. Such is probably the case with the carbonate of iron.

In some instances, Mr. Justamond used to join the corrosive sublimate with arsenic. Opium, added to both applications, mitigates the pain, without injuring the efficacy of the remedy.

The only mode of treatment, which Mr. Pearson has ever seen do any particular benefit to cancer, is that of keeping the patient on a diet, barely sufficient for the support of life, such as barley-water, alone, tea, &c. Patients, with cancers, receive considerable benefit from being kept strictly on a milk diet.

The old surgeons commonly dressed cancerous sores, with narcotic applications. Vesalius used cloths, dipped in the juice of the solanum; whilst others employed it mixed with oil of roses, and preparations of lead, and antimony. Others had recourse to the hyocyamus; but, of late, the cicuta poultices seem to have superseded most other narcotic applications. These have undoubtedly, in many cases, as Mr. Burns observes, abated the pain, and diminished the fetor; but, this is all which can reasonably be expected; and even this expectation will not always be realized.

Carrot poultices are better, than those of hemlock, as they produce as much ease, and diminish the fetor more powerfully.

The fetor of cancers having been thought to resemble that of the kali sulphuratum (liver of sulphur) and the oxygenated muriatic acid being the best agent for decomposing, and destroying such smell, it has been recommended, as an application to cancerous sores. It may correct the fetor; but, it will never accomplish a cure.

Carbonic acid has been said not only to correct the fetor, but, in some instances, completely to cure the disease. It was long ago proposed, says Mr. Burns, by M. Peyrille, and, of late, it has again been brought forward by Dr. Ewart. Experience, however, has not shewn, that the efficacy of carbonic acid, in cases of cancer, is very great. Fourcroy remarks: "After the first applications, the cancerous sore appears to assume a more favourable aspect; the sanies, which flows from it, becomes whiter, thicker, and purer, and the flesh has a redder and fresher colour; but, these flattering appearances are deceitful, nor do they continue long, for the sore speedily returns to its former state, and its progress goes on, as before the application." The best method of applying carbonic acid is, by means of a bladder, the mouth of which is fastened round the sore, with adhesive plaster. The air is introduced by a pipe, inserted at the other end.

Sometimes, the fermenting poultice is employed.

Digitalis, as a local application, is entitled to about as much confidence as cicuta.

Tar ointment, gastric juice, absorbent powders, &c. have been tried; but, without any evident good. (See *Burns on Inflammation, Vol. 2.*)

Mr. Fearon rejects, probably with much reason, all internal remedies, as inefficient in the treatment of cancer; and, he recommends, in the early stages of the complaint, a method of practice founded on his idea of the inflammatory nature of the disease. "In the beginning of scirrhous affections of the breast and testis, the mode I have adopted of taking away blood, is by leeches repeatedly applied to the parts. In this course, however, I have often been interrupted by the topical inflammation, produced by these animals, around the parts where they fastened. In delicate female habits, I have often lost a week, before I could proceed to the re-application of them. When the symptoms lead me to suspect the stomach, uterus, or any of the viscera, to be so affected, that the complaint either is, or, most probably, soon will become cancerous, I then have recourse to general bleedings. But, whether topical, or general, perseverance for a sufficient length of time, is necessary. Though the pulse never indicated such practice, yet the patients have not suffered by repeated bleedings; on the contrary, when they passed a certain time without losing blood, they felt a return of their symptoms, and, of their own accord, desired to be bled again. To this plan of repeated bleedings, I joined a milk and vegetable diet, avoiding wine, spirits, and fermented liquors." Mr. Fearon used also to keep the belly open, and employ saturnine applications.

From the preceding accounts, we may infer, that scarcely any reliance is to be placed on any known remedy, or plan, in cases of real scirrhi, and ulcerated cancers. The operation is the only rational means of getting rid of the disease; and, to waste time, so as to allow the disorder to increase in a serious degree, merely for the sake of trying a train of unpromising medicines, is a conduct, which is unworthy of a wise surgeon's imitation.

Perhaps, in early cases, it may be right to make trial of arsenic, cicuta, or preparations of iron. But, the practitioner should beware of devoting too much time to medicines, which will in all probability prove inadequate to the object, for which they are exhibited. Mr. Fearon's method seems also warrantable, together with diet merely enough to support life; but the punishment, attending a resignation to this last regimen, would be greater, than that of having the disease cut away, while the chance of efficacy would be much less. Upon the whole, therefore, the operation is what we should generally resort to, as the surest, and the safest means of getting rid of cancerous diseases. As I have before remarked, the operation is always admissible, when every particle of the disease can be removed by it. Even large open cancers, if they can be entirely cut away, are often capable of being effectually cured.

The removal of cancerous disorders even in the slightest and most trivial cases, should always be effected with the scalpel, in preference to caustic; the use of which, though formerly recommended by some authors, and still adhered to by some, (*Young*) ought, for very obvious reasons, to be entirely laid aside. The irritation generally occasioned by every application of the caustic kind, together with the pain and inflammation, which commonly ensue, are strong objections in cancerous cases. Plunket's remedy, which is chiefly arsenic, is equally objectionable. Nor can you, at once, so certainly extirpate every atom of cancerous mischief with any caustic, as you can with the knife: for, with this, you immediately gain an ocular inspection of the surface surrounding the disease, so as to see and feel whether the disordered parts are completely removed, or whether any portion of the disorder requires a further employment of the instrument. With respect to the pain, that of caustics is infinitely greater, more intolerable, and more tedious, than that occasioned by the knife. When caustic also fails in destroying every particle of the disease at once, it almost always tends to enlarge, in a very rapid way, the original boundaries of the mischief. For an account of the method of removing scirrhi and ulcerated cancers, see *Mamma, Removal of.*

For information on cancer, the reader is particularly referred to *Le Dran's Operations in Surgery, p. 287, &c. Edit. 2. B. Bell's Surgery, Vol. 2. Justamond on Cancers. Hill's Cases in Surgery. Pearson on Cancerous Complaints. Abernethy's Surgical Observations, 1804. Fearon on Cancers. B. Bell on Ulcers. Home on Cancer. Adams on Cancerous Breasts, and on Morbid Poisons. Medical Museum, Vol. 1. London Medical Transactions, Vol. 1. Gooch's Med. Observations, Vol. 3. L'Encyclopédie Méthodique, Partie Chirurgicale. Article Cancer, in London Medical Dictionary, and Rees's Cyclopædia. Practical Observations on Cancer, by the late John Howard. Mémoire Renfermant quelques Vues Générales sur le Cancer, in Œuvres Chirurgicale de Desault par Bichat, Tom. 3, p. 406, &c. Richerand's Nosographie Chirurgicale, Tom. 1, p. 377, &c. Edit. 2. Lambe's Reports of the Effects of a peculiar Regimen in Cancerous Complaints. Baillie's Morbid Anatomy of some of the most important Parts of the Human Body. The Queries of the Society for investigating the Nature and Cure of Cancer may be seen in the Edinb. Med. and Surgical Journal, Vol. 2, p. 382, &c. Consult also Wardrop on Fungus Hæmatodes, in which may be seen an interesting comparative view of this last affection and cancer. Denman's Observations on the Cure of Cancer, and on Carmichael's Essay on Cancer, Edit. 2.*

CANCER SCROTI. CHIMNEY-SWEEPER'S CANCER. (See *Scrotum.*)

CA'NCRUM ORIS. A deep, foul, irregular, fetid ulcer, with jagged edges, which appears upon the inside of the lips and cheeks, and is attended with a copious flow of offensive saliva. According to Mr. Pearson, this disease is seldom seen in adults; but, most commonly, in children from the age of eighteen months to that of six, or seven years. The gums, as well as the lips and cheeks, are sometimes affected, in which circumstance, the teeth are generally carious and loose. The ulceration is occasionally attended with abscesses, which burst either through the cheek, lip, or just below the jaw. Exfoliations are not unfrequent, and, when the disease is neglected, extensive sloughing sometimes happens.

Living in a marshy situation; unwholesome food; and inattention to cleanliness; are suspected of being conducive to this disorder. The causes of the affliction seem not to be much understood; but, it is remarked, that the disease prevails most in houses, where children are crowded together. It is uncertain, whether the complaint is contagious.

Though children are the usual subjects of this disease, grown-up persons sometimes do not escape its attacks.

The treatment recommended consists, in extracting diseased teeth and loose pieces of bone; directing a milk vegetable diet, with a prudent quantity of fermented liquors; and prescribing bark, sarsaparilla, and elm bark, with mineral acid.

The best external applications are said to be such as diluted mineral acids; burnt alum; the decoctum cinchonæ, with the zincum vitriolatum; tincture of myrrh; lime water, with spirit of wine, &c. (See *Pearson's Principles of Surgery, Edit. 2. p. 287.*)

We cannot conceive it a safe and prudent method to use any preparation of copper, as an application to the ulcer. However, such practice has an advocate in the preceding author.

CANKER OF THE MOUTH. (See *Cancrum Oris.*)

CANNULA. Any kind of small tube, employed for surgical purposes.

CANTHA'RIDES. (*Lyttæ.*) Spanish, or French flies, with which the common blistering plaster is made. In surgery, they are also prescribed in incontinence of urine, gleets, &c. The tincture is sometimes used as a liniment for stimulating parts.

CAPELINA. (from *capeline*, a woman's hat, or bandage, French.) *A reflex bandage.* It is a double-headed roller, about twenty-four feet long, and four inches broad; sometimes narrower. The middle is applied to the occiput, and, after two or three circular rounds, the rollers intersect each other upon the forehead and occiput; then one roller being reflected over the vertex to the forehead, the other is continued in a circular track. They next cross each other upon the forehead, after which the first head is carried back obliquely towards the occiput, and reflected by the side of the other.

The last is continued in a circular direction; but the first is brought again over the sagittal suture, backward and forward, and so continued, till the whole head is covered.

This bandage used to be applied in cases of hydrocephalus; it has no advantage, however, and is now hardly ever used.

**CAPILLARY FISSURE.** A very minute crack in the skull. The term came into use from the resemblance of such a fracture to a hair.

**CAPISTRUM.** (καπιστρον, from *caput*, the head; as being made to guide and govern the head.) A surgical bandage, somewhat resembling a bridle or head-stall. (See *Bandage*.)

**CARBUNCLE.** (from *carbo*, a burning coal.) *Anthrax.* This is a very common symptom in the plague; but comes on also sometimes as a primary disease. The first symptoms are great heat and violent pain in some part of the body, on which arises a kind of pimple, attended with great itching; below which a circumscribed, but very deep-seated, and extremely hard tumour may be felt with the fingers. This tumour soon assumes a dark red, or purple colour, about the centre, but is considerably paler about the edges. A little blister frequently appears on the apex, which, as it occasions an intolerable itching, is often scratched by the patient. The blister being thus broken, a brown sanies is discharged, and an eschar makes its appearance. Many such pimples are sometimes produced upon one tumour, in consequence of the patient's scratching the part.—(*Bromfield's Observ. Vol.* 1.)

Carbuncles have been distinguished into the *benign* and *malignant* kinds; but, these distinctions appear to be scarcely warrantable, or, at best, they are only founded upon the different degrees of violence, with which the disease makes its attacks. Some carbuncles are said to be *pestilential*, while others are not so. Fortunately, all the cases, which are met with in this country, are of the last sort; for, no opportunities of remarking the pestilential anthrax have occurred in England since the deplorable periods of 1665, and 1666.

The carbuncle sometimes appears in persons affected with putrid fevers, in which case, it is attended with great weight and stiffness of the adjacent parts; the patient is restless and pale, the tongue white, or of a deep red, and moist; the pulse low, urine sometimes pale, sometimes very turbid, with all the other symptoms, in an exaggerated degree, which attend typhoid fevers. The patient often complains much of his head, either from pain, or giddiness. Sometimes, he is drowsy; at other times, he cannot get the least sleep. Occasionally, he is delirious. The case is also apt to be attended with chilliness, or rigors, and profuse perspirations. The patient is sometimes costive, sometimes afflicted with a profusion of stools; he generally complains of loss of appetite, nausea, and vomiting, takes but little nourishment, complains of difficulty of breathing, and is extremely low, with palpitations of the heart, and sometimes faintings. (See *Bromfield's Observations, Vol.* 1. *p.* 122.)

Sometimes a little slough, of a black colour, appears in the middle of the tumour. This was supposed by the ancients to be a part of the body burnt to a cinder, or hard crust, by the violence of the disease. The carbuncle is considered by some as a sort of gangrenous affection of the cellular substance. (*Latta.*) The progress of carbuncles to the gangrenous state is generally quick. Their size is very various; they have been known to be as large as a plate. Considerable local pain and induration always attend the disease. The skin, indeed, has a peculiar feel, like that of brawn. As the complaint advances, several apertures generally form in the tumour. Through these openings, there is discharged a greenish, bloody, fetid, irritating matter. The internal sloughing is often very extensive, even when no sign of mortification can be outwardly discovered.

If attention is paid to the skin in this case, we shall frequently find some miliary eruptions about the clavicles, the breasts, or other parts of the body; and, towards the latter end of the disorder, a different collection of large pimples will sometimes be thrown out, like the small-pox, and suppurate. Some of these, indeed, are occasionally converted into actual carbuncles. It was this species of anthrax, which was called *malignant*, and, certainly, if any cases, seen in this country, demand this epithet more strongly, than others, it is the instance, the description of which we have just quitted.

The constitution is often so low and exhausted, that death follows. The carbuncle, indeed, is most frequent in old persons, whose constitutions have been injured by voluptuous living, and, hence, we cannot be surprised, that the local disease, influenced by the general disorder of the system, should assume a dangerous aspect.

The degree of peril may generally be estimated by the magnitude and situation of the tumour, the number of such swellings at the same time, the age of the patient, and the state of his constitution.

The duty of a surgeon, in cases of anthrax, may be described in a very few words. With regard to the local treatment of a carbuncle, the grand thing is to make an early, and free incision into the tumour, so as to allow the sloughs and matter to escape readily. As much of the contents as possible is to be at once pressed out, and then the part is to be covered with an emollient poultice. Indeed, until the tumour is opened, no applications are more proper than emollient poultices, and when an incision has been made, they are far preferable to any detersive antiseptic injections, made with bark, tincture of myrrh, &c. or to any lotions made with the sulphates of copper, and zinc, nitrate of silver, &c. fomentations will also be found to afford considerable relief both before and after an opening has been made. As the discharge is exceedingly fetid and irritating, it will be necessary to put on a fresh poultice two or three times a-day. The use of the poultice is to be continued, till all the sloughs have separated, and the surface of the cavity appears red, and in a granulating state, when soft lint and a pledget of some unirritating ointment should be applied, together with a tow compress and a bandage. The dreadful manner, in which the disease is protracted, by not making a proper opening in due time, cannot be too strongly impressed upon the mind of every practitioner, and it may justly be regarded as a frequent reason of the fatal terminations of numerous cases. Mr. Bromfield forcibly inculcates this necessity of making, at a proper time, an opening sufficient to draw out the sloughs; for, says he, in case you rely on that opening which is generally made by nature, the thin matter only will be discharged, and the sloughy membranes will remain, and the orifice close up. (See *Vol.* 1, *p.* 128.)

It was formerly not an uncommon custom to extirpate carbuncles with the knife, or to destroy them with the actual and potential cauteries. The French were very fond of burning the swelling with a hot iron, the employment of which is sanctioned by Pouteau. (See his *Œuvres Posthumes*). These methods, having been found cruelly painful, and, in no manner advantageous, have long been branded with the reproaches of all English surgeons. With respect to the constitutional treatment, we should remember, that the disease is for the most part met with in bad constitutions, and in persons who are weak and irritable. Hence, it is only when there is a full strong pulse, and the complaint is just beginning, that bleeding is allowable. Bark and camphor are the internal medicines most commonly needed. The vitriolic acid is also highly proper, as well as wine and aromatics. As the pain is very severe, opium is generally an essential remedy. The constitutional treatment is very analogous to that of mortifications, and, for this reason, I do not deem it necessary to enlarge the present article, by expatiating on this part of the subject. (See *Mortification.*)

In many of the southern parts of Europe, a malignant species of carbuncle, appears to be endemic, contagious, and very often fatal. For an account of this form of the disease, I would particularly advise the reader to consult *Richerand's Nosographie Chirurgicale, Tom.* 1, *p.* ccx, *&c. Edit.* 4, *and Larrey's Mémoires de Chirurgie Militaire, Tom.* 1, *p.* 104, *&c. Bromfield's Chirurgical Cases and Observations. L'Encyclopédie Méthodique, Partie Chirurg. art. Anthrax. Pearson's Principles. Richter's Anfangr. der Wundarzn. Band* 1. *Boyer's Traité des Maladies Chirurgicales, T.* 2, *p.* 50, *&c.*

**CARCINOMA.** (from καρκινος, a crab.) See *Cancer.*

**CARIES.** (from κειρω, to abrade.) The clearest way, in which we can convey an idea of caries, is, by comparing it with ulceration of the soft parts, in which we know a breach is produced by the action of the absorbents. All the bones are liable to caries; but those of a spongy texture are oftener attacked, than such as are compact. Hence, the vertebræ, astragalus, and other bones of the tarsus, those of the carpus, the sternum, and the extremities of long bones, are the most common situation of this affection. The bones of young persons are said to be more frequently carious, than those of old subjects.

Many authors have confounded caries with necrosis, which they have called dry caries. Others have considered it to be the same as exostosis. The carious part of a bone becomes so soft, that the end of a blunt probe may be easily forced into its substance. The openings, with which the bone is perforated, are filled with fungous flesh, which bleeds from the slightest cause. A dark-coloured serum is discharged, which always has a disagreeable smell, but becomes particularly fetid, when exposed to the air.

In necrosis, the bone is entirely deprived of the vital principle; in caries, this principle exists, and there is a morbid action going on, which destroys the texture of the bone.

Some of the causes of caries are internal, others external. The former are the most frequent; a contusion, or external violence, being more apt to produce necrosis than caries.

Abscesses are said to produce, occasionally, a caries of the bones, over which they take place. For this reason, it has been laid down, as a rule, to open such abscesses at an early period, in order to prevent the disorder of the bone. If some abscesses, however, as for instance, those which form over the anterior surface of the tibia, and mastoid process of the temporal bone, be frequently attended with caries, the latter is the cause and not the consequence of the suppuration. Pus, which is a bland, unctuous, inodorous fluid, never attacks the soft parts, with which it is in contact, until its qualities are changed by exposure to the air. When an abscess forms in the anterior part of the parietes of the abdomen, the peritoneum of that part, naturally a thin membrane, instead of being corroded, becomes thick, and strong enough to resist the effusion of pus into the cavity of the abdomen. The periosteum becomes thickened in similar circumstances, when the abscess is a consequence of an external injury.

Scrophula invades the spongy structure of the bones, and the lymphatic system. A caries from this cause is very common in the tarsus, carpus, elbow, and knee; but it is always preceded by a white swelling.

The venereal disease is sometimes a cause of caries, though its action on the bones often occasions necrosis, or exostosis. However, when it attacks the bones of the nose it renders them carious, by which they are consumed, and the face sadly disfigured. The bones of the palate are sometimes destroyed in the same manner, and by the same cause.

In cancers of the mammæ, the sides of the sternum are sometimes found carious.

A superficial caries is easily detected. When the affected bone is deeply situated, the disease may be ascertained by introducing a probe, which will readily pass into the substance of the bone. But, bones not easy of access, may become carious, in which cases, the diagnosis is not so obvious. However, if a fistula, from which a fetid blackish matter flows, run forwards to a bone, and the adjacent soft parts be swollen, and indurated, there is reason to suspect the existence of caries.

Caries, occasioned by syphilis, affects most commonly the tibia, os frontis, ossa nasi, ossa palati, and sternum.

A caries of the vertebræ is known by peculiar symptoms, among which a paralysis of the inferior extremities, and lumbar abscesses, are the most remarkable.

A caries of the spongy parts of bones is much more difficult to cure, than a similar affection of their compact parts. Caries of the carpal and tarsal bones is particularly obstinate. These bones being in close contact, the affection cannot easily be prevented from spreading from one to the other. Amputation is often the only means of cure. The same is frequently the case, when the spongy heads of the long bones become carious. Even this mode of relief is not practicable when the head of the bone lies very deeply, like that of the os femoris.

Caries, resulting from scrophulous, or cancerous mischief, is more difficult of cure, than when it arises from venereal or scorbutic causes; for, some efficacious remedies against the latter are known; but cancer and scrophula resist all the remedies hitherto discovered. The prognosis is less favourable in old, than young subjects, and much depends on the extent of the disease, the patient's strength, and the state of the soft parts.

"The absorption of bone like that of soft parts (says Dr. Thomson,) may be distinguished into interstitial, progressive, and ulcerative. We have ample proofs of the interstitial absorption, or that which is daily, hourly, and unceasingly taking place from every part of the substance of bone, in the deposition and removal of phosphat of lime, that has been tinged with madder. If too much earth be removed, the quantity of animal matter will be relatively increased, and a disposition given to softness of the bones—a state, which exists in the bones of children in the disease called the rickets, and in the bones of older people in that denominated mollities ossium, or the rickets of grown people.

"I have already had occasion to mention the effects of the progressive absorption of bone, as manifested in the progress of aneurisms and other tumours to the skin; but, the formation of pus is by no means a necessary, constant, or even frequent attendant on the progress of progressive absorption in bone. Hydatids in the brains of sheep, tumours growing from the pia or dura mater in the human body, (see *Dura Mater,*) or aneurism seated over the cranium, or within the cavity of the chest, are often the cause of the whole substance of a bone being removed, layer after layer, by progressive absorption, without the formation of a single particle of pus. This state of the bone has often been confounded, but improperly, with that state of the bone, which arises from ulcerative absorption, the state, which is properly denominated caries, and in which, one or more solutions of continuity may be produced upon the surface, or in the substance of the bones. The ulcerations occasioned in bones by the venereal disease, afford by far the best marked examples of the effects and appearances of ulcerative absorption, or caries in bones, &c." (See *Thomson's Lectures on Inflammation, p.* 389.)

To form a just idea of the treatment of caries, we should consider, that a bone, thus affected, is a prey to a morbid action of its own parts, and that this action creeps from one part to another, and pervades the whole with greater or less rapidity, if art should not interfere, and assist nature in arresting its progress.

When the caries arises from constitutional disease, this should be resisted with suitable remedies.

Thus mercurial and sudorific medicines put a stop to caries arising from the venereal disease. Spirituous drinks, vegetable diet, and acids, cure both the scurvy, and the caries dependent on it.

But, when caries is altogether a local affection, the separation of the diseased parts may be promoted by absorbent powders, and stimulant applications. Lint, dipped in the tincture of aloes or myrrh, has often been put on such diseased bones. If these remedies be found ineffectual, a pledget of lint, dipped in a solution of the argentum nitratum, may be employed.

On the continent, and particularly in France, they still adhere to the plan of touching carious parts of bones with the actual cautery, after bringing them fairly into view by a previous use of the knife. It is thought, that the burning iron acts by changing the caries into a necrosis, irritating the subjacent sound parts, and exciting that action of the vessels, by which the dead or diseased part of the bones must be thrown off. (See *Boyer on Diseases of the Bones, Vol.* 1.)

Issues seem to be most effectual in checking the caries attendant on white-swellings and diseased vertebræ. (See *Joints and Vertebræ.*)

Mr. Hey has succeeded in cutting away a carious part of the tibia. He began the operation by dissecting off the granulations of flesh, which had arisen from the bone, and then sawed out, by means of a circular headed saw, a wedge of the tibia, two inches in length. The removal of this portion brought into view a caries of the cancelli, almost as extensive as the piece already removed. With different trephines, suited to the breadth of the caries, Mr. Hey removed the diseased cancelli of the bone, quite through to the opposite lamella. As the caries extended in various directions, it was not possible to remove the whole of it with a trephine, without removing also a large portion of the sound part of the bone, which Mr. Hey wished to avoid. By the assistance, therefore, of a strong sharp-pointed knife, he pursued the caries in every direction, until every part was taken away, which had an unsound appearance. The wound was simply dressed with dry lint; the whole surface was speedily covered with good granulations, and a complete cure was obtained, without any exfoliation.

Mr. Hey concludes this subject, as follows: " I have treated some other cases of caries of the tibia in the same manner, and with equal success. Where the extent of the caries is not so great as to prevent a complete removal of the morbid part, this method is extremely useful, and far superior to the use of the potential or actual cautery.

" The trephine is not wanted, where the cancelli of the bone are not affected with the caries. The diseased parts of the lamella may be removed with gouges or small chisels. Granulations of flesh will then arise from the sound parts of the bone, and become united with the integuments, which ought to be preserved as far as is possible."

The two cases, which Mr. Hey has related, are exactly of that kind, to which several writers apply the term *spina ventosa.* (See *Practical Observations in Surgery.*) The reader may further consult on the subject of *Caries, Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 1, *p.* 493. *Boyer's Traité des Maladies Chirurgicales, T.* 3, *p.* 453, *et seq. Paris;* 1814. *Richerand's Nosographie Chirurg. T.* 3, *p.* 134, *edit.* 4. *Paris;* 1815.

**CARUNCLE.** (dim. of *caro,* flesh.) A small fleshy excrescence.

**CASTRATION.** The operation of removing a testicle. For an account of the cases rendering this necessary, see *Testicle, Diseases of.* The manner of operating is as follows: The patient being laid on a table of convenient height, the integuments covering the spermatic vessels in the groin, are to be divided. This incision should begin as nearly as possible, opposite to the opening in the abdominal muscle, and should be continued a good way down the scrotum.

The manner of beginning this incision is differently described by writers; some of them advising that the skin be held up by an assistant; others that the knife be used perpendicularly in this as in other parts. The latter mode is preferred by English surgeons in general. The length of the division is a more important consideration. A small wound will indeed serve to lay bare the spermatic chord; but it will not permit the operator to do what is necessary afterwards with dexterity, or facility; and as the scrotum must, first or last, be divided nearly to the bottom, it had better be done at first. The spermatic chord, thus laid bare, is to be freed from its surrounding membranous connexions; and then the operator, with his finger and thumb, separating the blood vessels from the vas deferens, must pass a ligature between them, and having tied the former only, must cut through the whole chord, at a quarter or half an inch distance from the said ligature, according as the state of the process and testicle will admit. This done; he is then, with the same knife, with which he has performed the former part of the operation, to dissect the testicle out from its connexion with the scrotum: the loose texture of the connecting cellular substance, the previous separation of the testicle from the spermatic chord, and the help of an assistant to hold up the lips of the wound, will enable him to do this with very little pain to the patient, and great facility to himself. If any considerable artery bleeds in the scrotum, it is to be tied. (*Pott.*)

Mr. S. Sharp once castrated a man, whose testicle weighed above three pounds, and some of the vessels were so exceedingly varicous and dilated, as nearly to equal the size of the humeral artery. (*Operations of Surgery, chap.* 10.)

Desault first divides the chord, and, holding its upper end between the index finger and thumb of his left hand, he then takes up the arteries with a pair of forceps, and they are immediately tied by an assistant. (*Desault par Bichat, Tom.* 2.)

The spermatic artery, and any scrotal vessels, which require it, should be tied with fine silk ligatures, as recommended by my friend Mr. Lawrence. (See *Medico-Chirurg. Trans. Vol.* 6, *p.* 197.)

Pott used to fill the cavity of the wound with lint; but Desault, and all the modern surgeons of this country, bring the edges of the wound together, and endeavour to heal as much of it as possible by the first intention. Some, with this view, use sutures and sticking-plaster; others, only the latter, aided with compresses and a T bandage; which means, in my humble opinion, are quite enough.

The operation of the compresses and bandages cannot be too carefully attended to, as it is the surest means of preventing hemorrhage from any small arteries in the scrotum, while it conduces to the union of the parts. Care must be taken, however, not to let the pressure hurt the sound testicle.

The plan of dressing adopted by Mr. Lawrence, consists in retaining the edges of the skin in apposition with two or three sutures, and then applying a narrow strip of simple dressing. A folded cloth, kept constantly damp, is also laid over the wound. (*Medico-Chir. Trans. Vol.* 6, *loc. cit.*) I have often seen, however, considerable irritation and an extensive erysipelas follow the employment of sutures after castration. M. Roux also noticed their bad effects in a case, which occurred during his visit to this country. (See *Parallèle de la Chirurgie Angloise avec la Chirurgie Française, p.* 121.)

It is somewhat extraordinary, that M. Larrey should condemn the plan of uniting the wound, though, indeed, we cannot be surprised at his delivering this advice, when we recollect, that he disapproves of healing the stump, after amputation, by the first intention. The passage, relative to dressing the wound after castration, seems to be a contrast to the sensible observations which generally prevail in this author's publication: "*Il ne faut pas, réunir les bords de la plaie, comme l'ont conseillé quelques praticiens, parce qu'ils doivent suppurer, et que la suppuration est nécessaire!* (*Mem. de Chirurgie Militaire, Tom.* 3, *p.* 426.)

Larrey is joined by M. Roux and the rest of the French surgeons on this point. The main reasons, stated by the latter writer, for not bringing the wound together, are, that secondary hemorrhage cannot be well guarded against, except by filling the part with charpie; that the redundance and looseness of the skin render it difficult to keep its edges in exact contact, without removing a portion of it and using sutures, which are objectionable; and that suppuration cannot commonly be prevented, because there is a large quantity of loose cellular substance in the wound, which substance readily suppurates. (*Parallèle de la Chirurgie Angloise avec la Chirurgie Française, &c. p.* 119, &c.) By applying cold water, and gentle compression to the part, I believe, however, such hemorrhage may generally be averted, and the union of the wound materially expedited. As a judicious writer observes: "In the London hospitals, complete union by the first intention is seldom, or never accomplished; yet, by attempting it, the wound is much diminished, and the cure of it rarely delayed later, than three or four weeks; whereas the wound, when stuffed with lint, is usually not healed in less than seven, or eight weeks." (See *Sketches of the Medical Schools of Paris by J. Cross, p.* 144.)

Sometimes, one or more vessels begin to bleed soon after the patient is in bed, although they effused no blood just after the removal of the testicle. Keeping the dressings and scrotum continually wet with the cold saturnine lotion very often, suffices for the prevention and suppression of such hemorrhage: if not, the wound must be opened again, and the vessels tied.

M. J. L. Petit has made some useful remarks on this operation. The vessels of the scrotum, says he, are not the only ones, which may be the source of hemorrhage. Anatomists know, that the septum, which divides this part into two cavities, is furnished with an artery, that is not considerable, but, which becomes materially enlarged, in the case of a sarcocele, or other tumour. It is sometimes so considerable, that it causes a bleeding, which makes a surgeon, who has had no previous opportunity of seeing the occurrence, exceedingly uneasy. Such hemorrhage, adds M. Petit, may be easily suppressed with a ligature; and, he assures us, that he has seen a surgeon dress the patient three times, without ever suspecting, that the bleeding, for which the applications were a third time removed, proceeded from this artery. (*Petit Traité des Maladies Chirurgicales, Tom. 2, p.* 524—525.)

The same experienced and able surgeon also acquaints us, that he has more than once extricated from trouble persons, who knew not how to stop the bleeding after the operation. He has seen some of them take off the dressings several times, without discovering the wounded vessel. As they imagined, that the only hemorrhage, that could follow castration, must be from the spermatic artery, they contented themselves with examining the ligature on the cord, and increasing the compression, in order to stop the bleeding; but, finding their attempts fail, they were compelled to seek assistance. On being sent for, M. Petit found, that the blood did not issue from the cord, but from a small artery, under the skin, at the inferior angle of the wound. He easily stopped the hemorrhage, and explained, not only, that the cord had no share in the accident, but, that it is generally suspected without foundation. Indeed, says he, the least constriction will stop the bleeding from the spermatic artery; it is not essential to tie it;—"I myself am content with cutting the cord, so as to leave it rather longer than usual, and apply no ligature; I press it against the os pubis, near the ring of the external oblique; I lay over it a linen compress, half as thick as the finger, two inches in length, sufficiently broad to cover the part, and yet narrow enough to be placed entirely within the wound. Over this compress, I put dossils of lint; I fill the scrotum with plain lint, and then cover the whole with compresses, observing to put one, which is thicker, than the rest, above the pubes, immediately over that, which I have laid upon the cord, so that the bandage may make moderate pressure on this last part, yet sufficient to prevent bleeding." (*Op. cit. p.* 526—527.)

This quotation is not made with a view of inducing any modern operator to imitate the preceding practice, which, indeed, the advantages of the present mode of dressing the wound entirely forbid, as well as the greater security of the ligature; but, the passage is cited, for the express purpose of impressing on the mind of the young surgeon, that, in general there is more risk of bleeding from the vessels of the scrotum, than those of the cord, after the removal of a diseased testis. I have never seen hemorrhage from the spermatic artery give trouble after the operation, but, have often known surgeons obliged to take off the dressings on account of bleeding in the scrotum.

In every operation, in which a considerable portion of skin is to be divided, and particularly in this, and in the amputation of women's breasts, it should always be remembered, that, as the division of the skin (the general organ of sensation) is the most acute and painful part of what is done by the knife, it cannot be done too quickly, and should always be done at once: the scrotum should always be divided to the bottom, and the circular incision in the skin of a breast always made quite round, before any thing else be thought of. If this be not executed properly, and perfectly, the operation will be attended with a great deal of pain which might be avoided, and the operator will be justly blameable. (*Pott.*)

When the diseased testicle is exceedingly large, or a part of the scrotum is diseased, the surgeon should take care to remove the redundant, or morbid portion of the skin, by including the piece, which he designs to take away, within two long elliptical incisions, which are to meet at the upper and lower part of the swelling. In this manner, as Mr. Samuel Sharp has observed, the hemorrhage will be much less, the operation greatly shortened, the sloughing of the distended skin prevented, and the recurrence of cancerous disease rendered less likely. (See *Treatise of the Operations, chap.* 10.)

Mr. Lawrence thinks it best in this operation always to remove a large piece of the scrotum with the testicle, by which means the surface of the wound is lessened. (See *Medico-Chirurgical Trans. Vol.* 6, *p.* 196.)

If the tumour be of a pyriform figure, perfectly smooth, and equal in its surface, and free from pain, notwithstanding the degree of hardness may be great, and the surgeon may, in his own opinion, be clear that the tumour is not produced by water, but is a true scirrhus, let him, immediately previous to the operation, pierce the anterior part with a trocar, in order to be certain. "My reason for giving this advice is, that I was once so deceived by every apparent circumstance of a true, equal, indolent scirrhus, that I removed a testicle, which proved upon examination to be so little diseased, that, had I pierced it with a trocar previous to the operation, I could and certainly should have preserved it." (*Pott.*)

It is well known, that the agony of tying the cord is immensely increased by including the vas deferens, and, as no good results from so doing, the practice deserves the severest reprobation, notwithstanding the opposite opinion of Mr. Pearson, and the writer of the article *Castration* in Rees's Cyclopædia.

Cases are even recorded, in which the inclusion of the whole of the spermatic cord appears to have occasioned severe and perilous consequences, and those in so great a degree, that it has been found necessary to cut and remove the ligature. Sometimes, says M. J. L. Petit, patients, on whom castration has been performed, suffer more or less acute pain in the kidnies. The suffering often becomes insupportable and highly dangerous, the belly being swelled, tense, and painful; the patient being affected with syncopes, and affections of the heart, sometimes with vomiting, and a retention of urine, lastly, an universal inflammation of the belly, and a violent fever, accompanied with delirium, are occasionally the fatal consequences of this operation. Petit was required to visit a patient, who had been in this deplorable state for twenty-four hours, after having suffered castration, and this distinguished surgeon could impute the sudden and violent symptoms to nothing, except the ligature on the spermatic cord; consequently, he advised, the ligature to be removed. The patient received some slight relief from this step, and, after having been bled twice within a short space of time, he found himself a great deal better; but, as the dressings became wet with blood, apprehension of bleeding began to be entertained. Petit, therefore, had recourse to moderate compression of the cord, in the manner above related. No hemorrhage ensued; the case afterwards went on well; and the patient recovered sooner than was expected. (*Traité des Maladies Chirurgicales, Tom.* 2, *p.* 527, 528.)

In the operation of removing a testicle, one caution seems particularly necessary, viz. if the cord should be at all enlarged, the surgeon ought carefully to examine, whether the augmentation of its size may not be owing to a portion of intestine, or omentum, that is contained within it. (See *Sabatier's Médecine Opératoire, Tom.* 1, *p.* 332, *Edit.* 1.) In one case of extirpation of the testicle, "after the operation was completed, and the wound dressed, the patient being seized with a fit of coughing, to the astonishment and dismay of the surgeon, the dressings were forced off by a protrusion of several convolutions of small intestines; from this, it was proved, that the patient had had a hernia; but, the diseased enlargement of the testicle had acted as a truss, and prevented the rupture from coming down." (See *Operative Surgery, by C. Bell, Vol.* 1, *p.* 226, *also p.* 224.)

There is another circumstance, which merits attention in the performance of this operation: when there are reasons, which oblige us to divide the cord high up, and this part has not been tied before such division is made, it may be drawn up by the cremaster within the abdominal ring, and some difficulty may be experienced in securing the spermatic arteries. Mr. B. Bell saw this happen twice, and the patients lost their lives from hemorrhage. Hence, when it is necessary to cut through the cord near the ring, the best plan is always to apply the ligature first, observing not to include the vas deferens. Were the cord, however, before being tied, to happen in any instance to be drawn up within the ring, a surgeon would be guilty of most supine neglect to let the patient die of bleeding; for, as Mr. C. Bell has remarked, we may follow the cord with perfect safety, even to the origin of the cremaster, which pulls it up, if attention be paid to the course of the cord, obliquely upward and outward, within the inguinal canal.

It sometimes happens, that abscesses form in the remains of the spermatic cord, after the operation of castration. Such suppuration may frequently be prevented by the employment of bleeding directly after the operation, and repeating the evacuation on the first access of the inflammation of the part concerned. Besides venesection, low diet, neutral salts, diluents, &c. are indicated, and the part should be covered with an emollient poultice. When the pus is completely formed, the abscess should be opened.

When the symptoms subside, observes M. Petit, they, who are little versed in practice, are apt to fancy the abscess cured; but, they are sometimes mistaken. The matter is not always sufficiently near the surface to be felt, and, in this circumstance, the aponeurosis of the external oblique muscle is so tense, that it hinders the fluctuation from being distinctly felt. Indeed, as the matter finds a lodgment under this aponeurosis, following the course of the sheath of the vessels, there is reason to fear, that it may lead to additional inflammation and suppuration, and extend up the duplicature of the peritoneum to the loins. In these cases, the abscess occasionally makes its way outward, and the dressings are inundated with matter; but, if this should not happen quickly, the sooner the tumour is opened the better. The opening ought unquestionably to be made wherever the fluctuation is plainly distinguishable; but, as Petit has remarked, the tension of the aponeurosis of the external oblique muscle makes the undulation of the matter less readily and plainly perceptible, than if the abscess were only in the fat. Therefore, in order to avoid mistake, this surgeon advises us to feel at the abdominal ring, as, in general, the pus can be more readily felt here, than in other situations. If matter is felt, and no resistance is experienced, Petit advises the finger to be passed into this opening, and, in case the seat of the abscess should be found to be under the aponeurosis, we are recommended to divide, with a probe pointed bistoury, the skin and fat immediately covering the ring, then to separate the fibres of this aperture, as it were, without cutting them. (See *Traité des Maladies Chirurgicales, Tom.* 2, *p.* 529—530.) No doubt, this surgeon meant, that the division of the tendon ought to be made in the direction of its fibres.

Consult *Le Dran's Operations. Sharp's Operations of Surgery, chap.* 10. *Pott on the Hydrocele, &c. Sabatier, de la Méd. Opér. Tom.* 1. *Bertrandi Traité des Opér. de Chirurgie, chap.* 11. *Œuvres Chirurgicales de Désault par Bichat, Tom.* 2, *p.* 449. *Larrey Mémoires de Chirurgie Militaire, Tom.* 3, *p.* 423, *&c. Pearson on Cancerous Complaints. J. L. Petit, Traité des Maladies Chirurgicales, Tom.* 2, *p.* 519, *&c. C. Bell's Operative Surgery, Vol.* 1. *Richerand's Nosographie Chirurgicale, Tom.* 4, *p.* 281, *&c. Edit.* 2, *&c. A long account of the particular sentiments of several eminent surgeons is to be found in Rees's Cyclopædia, art. Castration. Roux, Parallèle de la Chirurgie Angloise avec la Chirurgie Francaise, p.* 119, *&c. Lawrence in Medico-Chirurgical Trans. Vol.* 6, *p.* 196—197. *Sketches of the Medical Schools of Paris, by J. Cross, p.* 139, *&c.*

CATAPLASM. (from καταπλασσω, to spread.) A poultice.

The following are eminently useful.

CATAPLASMA ACETI. Made by mixing a sufficient quantity of vinegar with either oatmeal, linseed meal, or bread crumb. When linseed is employed, it is best to add a little oatmeal, or bread crumb, to keep the poultice from soon becoming hard. The vinegar poultice is generally applied cold, and is principally used in cases of bruises and sprains.

CATAPLASMA ACETOSÆ. *Sorrel Poultice.* ℞ *Acetosæ* lbj. To be beaten in a mortar into a pulp.

CATAPLASMA ÆRATUM. *Fermenting Poultice.* ℞ *Farinæ Tritici. Cerevisiæ Spumæ, Yest dictæ; singulorum,* ℔ss. These are to be mixed together and exposed to a moderate heat, till the effervescence begins. This is a celebrated application in cases of sloughing and mortification.

CATAPLASMA ALUMINIS. Made by stirring the whites of two eggs with a bit of alum, till they are coagulated. It has been applied to the eye, between two bits of rag, in some cases of chronic and purulent ophthalmy, and is said to do good to chilblains, which are not broken.

CATAPLASMA BYNES, (Malt.) ℞ Farinæ Bynes, Spumæ Cerevisiæ, q. s. This is applied to cases of gangrene and ill-conditioned extending sores. It is used in instances similar to those in which the cataplasma æratum is employed, and, by giving out carbonic acid gas, is supposed to operate as a gentle stimulus, and as a corrector of the fetid effluvia.

CATAPLASMA CARBONIS. Made by mixing powered charcoal with linseed meal and warm water, and is applied to improve the condition of several kinds of unhealthy sores.

CATAPLASMA CEREVISIÆ. Made by stirring some oatmeal, or linseed meal, in strong beer grounds. It is used in the same cases, as the Catasplasma Æratum, and Cataplasma Bynes.

CATAPLASMA CICUTÆ. *Hemlock Poultice.* ℞ *Herbæ cicutæ exfoliatæ* ℥ij. *Aquæ fontanæ* ℔ij. To be boiled, till only a pint remains, when as much linseed meal as necessary is to be added.

This is an excellent application to many cancerous and scrophulous ulcers, and other malignant sores; frequently producing a great diminution of the pain of such diseases, and improving their appearance. Justamond preferred the fresh herb, bruised.

CATAPLASMA DAUCI. *Carrot Poultice.* ℞ *Radicis Dauci recentis,* ℔j. Bruise it in a mortar into a pulp. Some, perhaps, with reason recommend the carrots to be first boiled. The carrot poultice is employed, as an application to ulcerated cancers, scrofulous sores of an irritable kind, and various inveterate malignant ulcers.

CATAPLASMA DIGITALIS. Made by mixing linseed meal with a decoction of the leaves of the plant. It is said to have great sedative virtues, to be adapted to the same cases, as the cicuta poultice, and even to be more beneficial.

CATAPLASMA FARINACEUM.—The bread and milk poultice, made by putting some slices of bread crumb in milk, and letting them gently simmer over the fire in a saucepan, till they are properly softened. The mass is then to be mixed and stirred about with a spoon, and spread on linen, in order to be applied. This poultice, which is of the emollient kind, is with many persons the common one for all ordinary purposes. Most surgeons, however, employ, instead of it, the linseed poultice, which is cheaper, more readily made, not apt to turn sour, and in all common cases, quite as advantageous in every respect.

CATAPLASMA LINI. *Linseed Poultice.* ℞ *Farinæ Lini* ℔ss. *Aq. ferventis* ℔iss. The powder is to be gradually sprinkled into the hot water, while they are quickly blended together with a spoon.

This is the best, and most convenient of all the emollient poultices for common cases, and has, in a great measure, superseded the bread and milk one, so much in use formerly.

Mr. Hunter speaks, in the following terms, of the linseed poultice, and its uses.

"Poultices are commonly made *too thin*; by which means, the least pressure, or their own gravity, removes them from the part: they should be thick enough to support a certain form when applied.

"They are generally made of *stale* bread, and milk. This composition, in general, makes too *brittle* an application; it breaks easily into different portions, from the least motion, and often leaves some part of the wound uncovered, which is frustrating the first intention.

"The poultice which makes the best application, and continues most nearly the same between each dressing, is that formed of the meal of linseed: it is made at once, and when applied, it keeps always in one mass.

"The kind of wound, to which the above application is best adapted, is a wound made in a sound part, which we intend shall heal by granulation. The same application is equally proper when parts are deprived of life, and consequently will slough. It is therefore the very best dressing for a *gunshot* wound, and probably for most *lacerated wounds*: for *lint*, applied to a part that is to throw off *a slough*, will often be retained till that slough is separated, which will be for eight, ten, or more days."

**CATAPLASMA LYTHARGYRI ACETATI.**

℞ Aquæ lythargyri acetati drach. j.
Aquæ distillatæ lib. j.
Micæ panis q. s.—Misce.

Practitioners, who place much confidence in the virtues of lead, externally applied, often use this poultice in cases of inflammation.

**CATAPLASMA MALI MATURI.** This is made by roasting a ripe apple, removing the peel and core, and beating the pulp into a soft mass. It is sometimes applied to inflamed eyes, by means of a little muslin bag.

**CATAPLASMA MURIATIS SODÆ.** ℞ *Pulveris Lini, Micæ Panis ā. ā. partes æquales, Aq. Sodæ Muriatæ q. s.* This is used for diminishing scrofulous tumours and glands. When it excites too much irritation in the skin, a linseed poultice may be put on for a little while.

**CATAPLASMA QUERCUS MARINI.**

This is prepared by bruising a quantity of the marine plant commonly called *sea tang*, which is afterwards to be applied by way of a poultice.

Its chief use is in cases of scrophula, white swellings, and especially glandular tumours.

When this vegetable could not be obtained in its recent state, a common poultice of sea-water and oat-meal was substituted by the late Mr. Hunter and other surgeons of eminence.

**CATARACT.** (from *καταρασσω*, to confound, or disturb; because the disease confounds, or destroys vision.) This is a species of blindness, arising almost always from an opacity of the crystalline lens, or its capsule; the cataract depending on an opaque state of the liquor of Morgagni being very rare.

Hippocrates called it, γλαυχωμα. Galen, ὑποχυμα. The Arabians, *gutta opaca*. Celsus, *suffusio*.

Hippocrates and the ancient Greeks described the cataract, as a disease of the crystalline lens under the name above mentioned; but, no sooner had Galen promulgated the doctrine of the lens being the immediate organ of sight, than the correct opinion of the ancient founder of medicine began to decline, and, for many ages afterwards, had no influence in practice. In fact, the seat of the cataract seems to have been entirely forgotten, till about 1656, when first Lasnier, and, afterwards, Borel, Bonnetus, Blegny, Geoffroi, &c. revived the truth, which appears to have been so long extinct; and they, and a few others, believed that the disease was situated in the crystalline lens. The bulk of practitioners, however, remained ignorant of this fact even as late as 1713, or, in other words, until the several publications of Mery, Maître-Jan, Brisseau, and Heister, combined to render the truth universally known. (*Critical Reflections on the Cataract.*)

### SYMPTOMS OF A CATARACT.

The cataract shews itself, as a speck, or spot in the pupil of the eye, occupying sometimes the whole, and sometimes only a part of this aperture. It is most commonly of a grey, or whitish colour; but, sometimes, of a deep white, and, it may, in all cases, be easily distinguished from the naturally dark appearance of the pupil. In the commencement of the disorder, it occasions a weakness, or imperfection of the sight; and it terminates, sooner, or later, in the almost total extinction of this sense. During its progress, the persons, who are affected by it, perceive objects more distinctly in a moderate, than a strong light; the reason of which is, that the pupil being more dilated in a weak light still admits some rays, through the yet transparent circumference of the crystalline. (*Wenzel on the Cataract.*)

A settled mist seems to cover objects, and confuse those, which are minute. In this disorder, especially, when it arises without any assignable external cause, this mist is almost always perceptible by the patient, before any opacity has become visible in the pupil. (*Ware.*)

### DIFFERENT KINDS OF CATARACT, AND PARTICULAR SYMPTOMS OF EACH.

When the opaque lens is either more indurated, than in the natural state, or retains a tolerable degree of firmness, the case is termed, a *firm*, or *hard cataract.* When the substance of the lens seems to be converted into a whitish, or other kind of, fluid, lodged in the capsule, the case is denominated a *milky*, or *fluid cataract.* When the opaque lens is of a middling consistence, neither hard, nor fluid, but, about as consistent, as a thick jelly, or curds, the case is named a *soft, or caseous cataract.* When the anterior, or posterior, layer of the crystalline capsule becomes opaque, after the lens itself has been removed from this little membranous sac, by a previous operation, the affection is named a *secondary membranous cataract.*

There are no certain criteria, by which it can be ascertained previously to an operation, whether a cataract is soft or hard; of a caseous or fluid consistence; or whether, together with an opacity of the crystalline lens, the membranous capsule, in which it is contained, may not have lost its natural transparency; those formerly mentioned by Richter, and other similar ones proposed for consideration by Mr. Pott, cannot be sufficiently confided in, to form a guide in practice.

I think it right, however, to state, in as concise a manner as possible, certain symptoms and appearances, which Richter has more recently explained, and, for a long series of years, found generally to portend the truth.

The harder the cataract is, the thinner and smaller it becomes. In this case, the disease presents either an ash-coloured, a yellow, or a brownish appearance. The interspace, betwixt the cataract and pupil, is very considerable. The patient very distinctly discerns light from darkness, and can even plainly perceive large bright objects. In the dilated state of the pupil, a black circle surrounding the lens is very perceptible. The motions of the pupil are free and prompt. The anterior surface of the cataract appears flat without any degree of convexity. (*Richter's Anfangsgründe der Wundarzneykunst, p.* 177. 3 *Band.*)

The fluid, or milky cataract, has usually a white appearance; and irregular spots and streaks, different in colour from the rest of the cataract, are often observable on it. These are apt to change their figure and situation, when frequent and sudden motions of the eyes occur, or when the eyes are rubbed and pressed; sometimes, also, these spots and streaks vanish, and then re-appear. The lower portion of the pupil seems more opaque than the upper, probably, because the untransparent and heavy parts of the milky fluid, sink downward to the bottom of the capsule. The crystalline lens, as it loses its firmness, commonly acquires an augmented size. Hence, the fluid cataract is thick, and the opacity close behind the pupil. Sometimes, one can perceive no space between the cataract and margin of the pupil. In advanced cases, this aperture is usually very much dilated, and the iris moves slowly and inertly. This happens because the cataract touches the iris, and impedes its action. The fluid cataract is sometimes of such a thickness, that it protrudes into the pupil, and presses the iris so much forward, as to make it assume a convex appearance. Patients, who have milky cataracts, generally distinguish light from darkness very indistinctly, and sometimes not at all; partly, because the cataract, when it is thick, lies so close to the iris, that few or no rays of light can enter between them into the eye; partly, because the fluid cataract always assumes, more or less, a globular form, and therefore has no thin edge, through which the rays of light can penetrate. (*Richter's Anfangsgründe der Wundarzneykunst, 3 Band.* 174, 175.) Mr. Travers believes, that fluid cataracts are rarely contained in a transparent capsule, and his experience has taught him, that this membrane is partially opaque, presenting a dotted, or mottled surface. The opaque spots are most distinguishable when viewed laterally. (See *Medico-Chir. Trans. Vol.* 4, *p.* 284.)

Sometimes the opaque lens is of a middling consistence, neither hard, nor fluid, but about as consistent as thick jelly, curds, or new cheese. Cases of this description are termed soft or caseous cataracts. As the lens softens in this manner, it commonly grows thicker and larger, even acquiring a much greater size than the fluid. It is not unfrequent to meet with caseous cataracts of twice the ordinary size of a healthy crystalline lens. It impedes the motion of the pupil more considerably than the fluid cataract, because it lies closer to the iris. It is accompanied with all the symptoms of fluid cataracts, except that the spots and streaks, sometimes also observable, on this kind of cataract, do not vary their situation and figure. (*Richter's Anfangsgründe der Wundarzneykunst, p.* 178. 3 *Band.*) According to Mr. Travers, the caseous cataract has a heavy dense appearance, uniformly opaque, a clouded, not a fleecy, whiteness, and sometimes a greenish, or dirty white tinge. (*Medico-Chir. Trans. Vol.* 4, *p.* 285.)

He further states, that what he terms the *flocculent* or *fleecy*, and the *caseous*, or *doughy* cataracts are most frequently met with; the *fluid*, or *milky* cases, and those called *hard*, being comparatively rare. (*Op. et loc. cit.*)

The same gentleman has observed, that, when a transparent circumference can be seen on dilating the pupil with belladonna, he has never found the capsule opaque; and he believes, that the black rim may be considered as the diagnostic mark of the transparency of the capsule. But, where the opacity of the lens is diffused, this sign is of course absent. (*P.* 283.)

"When the capsule is completely opaque (says Mr. Travers,) we can hardly judge of the texture of the lens." But, in such examples, "the lens is commonly diminished in bulk; it undergoes a waste after the opacity of the capsule, so as in process of time to become a membranous cataract. This I conceive to be owing to the obliteration of the vessels of the capsule, from which those of the lens are derived. When the capsular opacity is congenital, it is either purely capsular, or only a very small piece of lens remains. When the capsule turns opaque from injury, the lens is soon greatly reduced in bulk, as appears from the falling in, or concavity of the iris, which loses its support, and is demonstrated in the operation. This observation renders the operation with the needle appropriate to the cataract, in which the capsule is opaque, in cases which are not very recent. When the capsule of the vitreous humour (the posterior layer of the crystalline capsule as it is often called) is the seat of the opacity, I have not observed, that the lens undergoes any diminution, nor have I yet ascertained the remediableness of this case." (*Travers in Medico-Chir. Trans. Vol.* 4, *p.* 286.)

### CAUSES OF THE CATARACT.

Persons, who are much exposed to strong fires, as blacksmiths, locksmiths, glassmen, and those, who are engaged in similar employments, seem to be more subject to the cataract, than others. Persons, above the age of forty, are reckoned more liable to cataracts, than younger subjects. (*Wenzel.*) The disease, however, is, by no means, unfrequent in the latter; even children are often seen affected with this kind of blindness, and some are born with it. The habitual vision of minute objects, in a depending position of the head, by which an undue proportion of blood is said to be thrown upon the organ, frequently brings on cataracts. (See *Medico-Chir. Trans. Vol.* 4, *p.* 279.) In the majority of instances, a cataract seems to arise spontaneously, without any assignable cause. Sometimes the opacity of the lens is the consequence of external violence: a case, which, more frequently, than any other, gets well without an operation.

Frequently (says a modern writer) the cataract "proceeds from an hereditary disposition, which has existed for several successive generations; while, in other cases, it attacks several members of the same family, without any disposition of this kind being recognizable in their progenitors. Among others, Janin mentions a whole family of six persons, who laboured under this disease. (*Obs. sur l'Oeil, p.* 149.) Richter extracted the cataract from a patient, whose father and grandfather had been affected with the same malady, and in whose son, at that period, it had begun to manifest itself. He adds, that he had seen three children, all born of the same parents, who acquired cataracts at the age of three years. (*On the different kinds of Cataract, p.* 3.) During my apprenticeship with the late Mr. Hill, of Barnstaple, I was present, when he operated on two brothers, and a sister, all of whom were adults, and who stated, that three or four others of their family were affected with symptoms not unlike those, which they had experienced at the commencement of the complaint. I myself recently operated on two gentlemen advanced in years, who informed me, that they had a brother, on his return from India, who was similarly affected." (See *Adams's Pract. Observations on Ectropium, Artificial Pupil, and Cataract, p.* 101, *London,* 1812.)

### PROGNOSIS, AND MODE OF JUDGING OF CASES FIT FOR AN OPERATION.

Some little attention is necessary to distinguish those cases of cataract, which afford a reasonable prospect of benefit from an operation, and to discriminate them from others, either less promising, or absolutely prohibitory of relief.

When, in the incipient state of the disease, the patient discerned objects, as it were, through a mist, which increasing in density, at length became a complete impediment to vision; when the opacity of the crystalline lens has supervened gradually, and has not been preceded by and is not accompanied with a chronic ophthalmy peculiarly affecting the interior of the eye; when no particular head-ach, nor pains in the eye and eye-brow have been experienced; when the pupil, notwithstanding the cataract, preserves its circular figure, and the faculty of varying its dimensions in the different degrees of light; when the patient can distinguish a brilliant light from total darkness; and, especially, if in a moderate light, where, usually, the pupil is not too much contracted, he should be able to distinguish bright colours, and the shadows of objects before him: there is every reason for performing, and expecting success from, an operation. (*Scarpa sulle Malattie degli Occhi.*)

The power of distinguishing light from darkness, is much more satisfactory, than motion of the iris. I have seen in St. Bartholomew's Hospital, and in the York Hospital under Mr. Albert, several cases of complete gutta serena in both eyes, in which there was the freest contraction and dilatation of the pupils. It is obvious, that, had such patients been, at the same time, afflicted with cataract (a complication by no means unfrequent), and a surgeon, induced by the moveable state of the iris, had undertaken an operation, how unavailing it must have proved, since the rays of light could only have been transmitted to an insensible retina. Richter, and Wenzel, make mention of these peculiarities, and the latter refers the phenomenon to the iris deriving its nerves wholly from the lenticular ganglion, while the immediate organ of sight, is constituted entirely by another distinct nerve. Hence we can no longer consider motion of the iris as an infallible criterion, according to several authors, (*Wathen*) that the retina is endued with sensibility. Relating to this subject, is a curious remark by Mr. Lucas in the Medical Observations and Inquiries: he attended, in conjunction with Messrs. Hey and Jones, his colleagues of the Leeds Infirmary, five children of a clergyman at Leaven, near Beverly, who were all born blind. He writes, "None of them can distinguish light from darkness, and, although the pupil is, in common, neither too much dilated nor contracted, and has motions, yet these do not seem to depend upon the usual causes, but are irregular."—(*Vol.* 6.)

The reciprocal sympathy between the two organs of sight, is so active, that no one, solicitous to acquire either physiological or pathological knowledge respecting them, ought, for a moment, to forget it. Hence, in the examination of cataracts, it is of the highest importance to keep one eye entirely secluded from the light, while the surgeon is investigating the state of the iris in the other; for, the very impression of the rays of light upon one eye, sensible to this stimulus, is known to be often sufficient to produce corresponding motions of the iris in the opposite one, although in the state of perfect amaurosis. In other examples of cataract, the pupil may be quite motionless, and yet sight shall be restored after the performance of an operation. (*Wenzel.*) There are, however, two circumstances, which may prevent us from ascertaining, whether the retina is sensible to light or not: the first is, a circular adhesion of the crystalline capsule to the iris. It must be a difficult thing to discriminate the nature of this case, by merely observing, as Richter directs, the distance between the cataract and pupil: inferring, that when the space, between the pupil and opaque lens, is inconsiderable, such an adhesion has happened; and, that when the cataract does not seem particularly close to the pupil, and yet the patient cannot discern light from darkness, it is complicated with amaurosis. The second circumstance, sometimes utterly preventing the ingress of any light to the healthy retina, is the round bulky form of the cataract.

But although I have remarked, that the power of distinguishing light from darkness is more satisfactory, than motion of the iris; it is not an unequivocal test of the retina being perfectly free from disease. While the gutta serena is incomplete, the patient can yet distinguish light, and the shadows of objects. Dilatation of the pupil is, also, a deceitful criterion to ascertain the complication of gutta serena with the cataract. When the cataract is large, or adherent to the iris, the pupil is frequently much dilated, however natural and sound the state of the optic nerve may be: the pupil often continues quite undilated in the most perfect gutta serena. (*Richter.*)

From all this it must be manifest, 1st, that the irregularity, and inconstancy of the symptoms of gutta serena, together with the possibility of particular states of the cataract rendering the patient utterly unconscious of the stimulus of light, make it necessary for the surgeon to be particularly attentive to the appearance, and to the history of the origin and progress of the disease, in order to understand the real condition of certain cases. 2d, That, when the patient can distinguish light from darkness, though the iris may be motionless, there is good ground for trying an operation. Possibly, in this circumstance, an incipient *amaurosis* may exist, but, the *chance of* the defect of the iris arising from other causes; the *certainty*, that the opaque body *must* be removed from the axis of sight, (even were the disease of the retina cured,) ere sight can be restored; and the *improbability*, that an operation to cure the cataract, will render the other complaint at all less remediable; fully justify the attempt. 3dly, That, should the patient have been free from particular pain in the head and eye; should he, in a previous stage of the cataract, have been able to distinguish light from darkness, and then suddenly have lost that power, in consequence of inflammation affecting the eye, and depriving the iris of motion; in which case there is ample reason to conclude, that adhesions between the iris and cataract have taken place; and should there be ground to suspect, from the appearances which I have already noticed, that the cataract is of exceedingly large dimensions; notwithstanding the incapacity to feel the stimulus of light, there is yet sufficient foundation to entertain a little hope, and to vindicate the practice of the only effort that can be availing, and, excepting a trivial and temporary pain, one that cannot be materially injurious to the patient. The concurrent testimony of almost all writers upon the subject confirms, that the restoration of sight has sometimes been effected in the most hopeless cases, and I am, therefore, of opinion with Mr. Lucas, that it is proper, in all doubtful cases, to try couching, as a remedy by no means violent or hazardous. (*Med. Observations and Enquiries, Vol.* 6, *p.* 257.)

As it not unfrequently happens, that cataracts, produced by external violence, spontaneously disappear, (*Pott, Hey, &c.*) the operation should never be too hastily recommended for such instances. One reason, assigned for not operating, when only one eye is affected, viz. that one eye is sufficient for the necessities of life, is but of a frivolous description; and, another, that the patient would never be able to see distinctly after the operation, by reason of the difference of the focus in the eyes, is, (I have grounds for believing) only a gratuitous supposition, blindly transmitted from one writer to another. In support of what I have here advanced, and to prove, that success does sometimes, probably in general (if no other causes of failure exist,) attend the practice of couching, and extraction, when only one eye is affected with a cataract, I shall first adduce a fact from Maître Jan. (*Traité des Maladies de l'Oeil. Edit. Paris*, 1741, 12*mo. Obs. sur une Cataracte laiteuse, p.* 196.)

“ Le 17 Octobre de l'année 1685. J'allai à Saviere pour abaiser une Cataracte dans l'oeil gauche d'un jeune garçon appellé Nicolas Very valet de Sebastien Coutan, laboureur. Cette cataracte me paroissoit d'une bonne couleur, la pupille se dilatoit lentement, et beaucoup, et se resserroit de même, quand je passois la main entre l'oeil et le grand jour, *le sain étant fermé*,” &c. After describing the operation, he continues: “ Quelques jours après je retournai le voir, et je trouvai que l'humeur aqueuse étoit fort éclaircie, et qu'il *distinguoit toutes sortes d'objets:* je le vis encore sept ou huit jours après en passant par son village, et je le rencontrai faisant son ouvrage, et entièrement guéri, sans qu'il parût qu'il eût jamais été incommodé de cataracte.”

Baron Wenzel was in the habit of extracting cataracts with the most successful result, when only one eye was affected with the disease, as may be learnt by referring to the cases here specified. (*Cases* 6, 13, 16, 19, 22, 25, 29, 30, 31, 34, &c. *Treatise on the Cataract.*) It will only be necessary to quote here two cases, related by this eminent oculist. “ Madame Harvey, a tobacconist, at Chalons sur Marne, presented a complicated case similar to the preceding. She had a cataract in the right eye, combined with an opacity in the anterior portion of the capsule, as appeared by the white spots and inequalities, of which I have spoken above, in the surface of the crystalline. *Her left eye was sound.* I operated on the right eye in the year 1782, &c. The patient suffered some pain in consequence of the operation, but it was soon removed by bleeding her in the foot; and, notwithstanding this obstacle, the sight was soon recovered to as great a degree of perfection as was possible after such an operation.” (*Wenzel on the Cataract, p.* 138, *Case* 16.)

The following case is as explicit as possible on the point under consideration. “ A poor woman, de la Ferté sous Jouarre, who had a cataract in the right eye upwards of ten years, came to consult me in the year 1780. I found all the symptoms of the case favourable to an operation,” &c. (after describing the manner of doing it, he continues); “ I immediately bound up, not only the eye that had undergone the operation, but the *sound one* also; a precaution, which it is necessary to use after all operations on the eye, even the most simple; it being almost impossible, that one eye should not follow the motions of the other, &c. In a fortnight she was perfectly cured; and, though the pupil remained larger than it was before the operation, or than that in the left eye, and had much less motion, yet this eye, as well as the other, perceived objects very distinctly.” (*Case* 22, *p.* 166. *In the Medical and Physical Journal for May* 1808, *there is a paper in support of the foregoing observations.*)

I next proceed to notice what Richter has remarked upon this head. He was formerly convinced, that the advice not to operate, when only one eye is affected with a cataract, ought, for several reasons, to be disregarded; he reminds us of the wonderful consent between the eyes, so that one is seldom diseased without the other, sooner or later, falling into the same state; and hence he questions, whether it may not be possible to prevent the loss of the sound eye by a timely operation? An non caveri possit jactura integri oculi tempestive extrahendo cataractam prioris? (Obs. Chir. Fascic. I.) He adverts to the remarkable case related by

St. Ives, where a man was wounded in the right eye by a small shot, and, shortly afterwards, had a cataract in it; he then gradually became blind in the left, but soon recovered his sight in it, after the cataract had been extracted from the right one. Here let us notice, that St. Ives (*Maladies des Yeux, Chap.* 15, *Art.* 3.) makes no mention of any confusion in vision, in consequence of the different refracting powers of the two eyes in question. Another reason, judiciously assigned by Richter, (*Obs. Chirurg. Fascic.* 1.) for disregarding the above precept, is, that in waiting until a cataract forms in the other eye, the existing one, which is at this moment, perhaps, in the most favourable state for the operation, may soon change so much for the worse (for instance it may contract such adhesions to the iris), as either to destroy all prospect of relief, or, at most, afford but a very precarious and discouraging one. The length of time necessary to wait is also very uncertain and tedious. I once saw a man in St. Bartholomew's Hospital, who had had a cataract in one eye fifteen years, during all which time the other continued quite sound. I am surprised that Richter should latterly have inculcated a contrary opinion, and, not given the particular facts, that have induced him to revoke, as it were, his former sentiments. The principal reason stated by him is, that the patient, not only does not see much more acutely with the two eyes after the operation, than with one before it, but, he frequently sees more confusedly; because the eye, that has been operated on, cannot see well without the aid of a glass, which, perhaps, the sound one does not require. "Er sieht nicht allein nach der Operation mit zwey Augen nicht viel schärfer, als vor der operation mit einem Auge, sondern er sieht auch oft undeutlicher, da das operirte Auge nicht ohne Brille, das gesunde aber vielleicht ohne Brille scharf siehet." (*Anfangsgrunde der Wundarzn. Dritter Band p.* 199.)

When I remember, that no cases are adduced by this author to contradict the rationality of his former sentiments; when I also reflect upon the facts recorded by Maitre-Jan, St. Ives, and Wenzel; when I contemplate, that Callisen mentions, as the feeble ground of his adopting the common opinion, that, in one single instance of this description, he was unsuccessful, without particularizing from what immediate cause the failure arose; there appears to my mind strong cause to believe, that the advice, not to operate, when there is only one cataract, and the other eye is perfect, rests upon the false basis of prejudice and plagiarism. Warner's objection is similar to that specified by Richter: he writes, "the eye, from which the crystalline lens is removed, cannot be restored to a degree of perfection at all equal to that of the sound eye, without *the assistance of a convex glass:*" (*Description of the Human Eye and its Diseases, p.* 85.) but, is not the power of using both eyes at the same time, even with the inconvenience of being necessitated to employ a glass for the purpose, preferable to being blind of one? The cases, which I have quoted, at least prove, that confusion in vision, is not always the result of the practice, which I contend for: whether the fact is concordant with the modern theory of vision, is entirely another consideration; if it should be found inconsistent with it, we must infer, that our knowledge of optics still continues imperfect; not, that such well-attested examples, as some alluded to, are unworthy of belief.

When there are cataracts in both eyes, most authors are of opinion, that there is no reason, why one should not be couched immediately after the other; and, it must be confessed, that, in general, the simplicity and mildness of the operation, will admit of this method without the least evil resulting from it. But it must also be confessed, that the ophthalmy after couching sometimes attains a greater height than is agreeable, either to the feelings of the patient, or the wishes of the surgeon. The excitement of violent inflammation, is what we ought to endeavour to avoid in performing all operations. Will it not inevitably happen, by reason of the mutual sympathy between the two organs of sight, that the ophthalmy after couching will, *cæteris paribus*, be more severe when it is done at the same time on both, than when performed on each at separate periods? Inflammation in one eye almost constantly kindles the same process in the other. Scarpa's experience establishes the truth of these reflections, and, what reason might anticipate, an appeal to practice confirms. "Ne' malati di cateratta in ambedue gli occhi, la sperienza mi ha insegnato che non è punto vantaggioso l' operarli immediatamente uno dopo l' altro; ma che giova aspettare la guarigione d' uno prima d' intraprendere l' operazione dell' altro." (*Saggio di Osservazioni, &c. p.* 255.)

The majority of surgeons imbibe an opinion, that no operation should be undertaken for the cataract, before the patient has attained the age of docility and reason, and, in a point of view, abstractedly surgical, there can be no doubt of the rectitude of such advice; but, when it is further considered, how essential sight is to the acquirement of education; that youth is the condition best adapted for this indispensable pursuit; that couching is a very easy operation; that, to perform it conveniently, nothing more is required, than to have the child's head steadily fixed; that, with the aid of an assistant, this object can most effectually be accomplished; that, in delaying the operation, the cataract may acquire adhesions; that persons have, not only had cataracts successfully depressed at a very early age, but, have, with the assistance of a *speculum oculi*, even had them extracted, (See *Mr. Ware's note, p.* 90, *of Wenzel's Treatise*,) which is universally acknowledged to be a far more difficult process; and that the pupil of the eye, in a young subject, is nearly as large as in an adult; (*Warner's Description of the Human Eye and its Diseases, p.* 34.) I cannot help thinking with Mr. Lucas, that, after a child is old enough to bear an operation, couching *may be proper* at any age. This gentleman (we may infer from his observations) was in the habit of couching children; for he states, that the reason for his not operating on the five children born blind (mentioned above), was the insensible state of the retina: not their youth.

Here couching seems to be more applicable than extraction; for, although it is very practicable to fix a child's head very securely, it is not so to prevent (without the use of a speculum, by which extraction is rendered doubly dangerous) that rolling motion of the eyes from taking place, peculiar, almost without exception, to children, and which would, undoubtedly, make it too arduous to cut the cornea with the due precision, necessary for the success of the more modern operation. Surgeons do not refuse to operate for the hare lip, as early as two years of age; they do not wait for docility and reason in the patient, to make him manageable, and sensible of the propriety of submitting quietly to the performance of the operation; they render him tractable by force, and thus they wisely succeed in making, perhaps, with more certainty, than reliance upon the fortitude of any human being would afford, a very precise incision, such as the nature of the operation demands; and, why should they refuse to couch children, when the motives are more urgent, and it is equally in the power of art to substitute means, quite as effectual as docility and reason in surgical patients? What experienced operator would trust to these qualities, when he undertakes any grand operation, even on the most rational and firm adult? (*Critical Reflections on the Cataract*, 1805.)

During the last few years, the attention of surgeons has been much drawn to the subject of operating on the cataracts of children, and the propriety of the practice seems to be now firmly fixed on the basis of experience. It is even ascertained, that the couching needle may be successfully employed on children of the most tender age. The late Mr. Saunders, surgeon to the London Infirmary for curing diseases of the eye, may be said to have had the principal share in promoting the adoption of this important improvement. His practice confirmed, what reason had long ago made probable, and the judgment, tenderness, and skill, with which he operated, on the eyes of infants, as well as those of adults, were followed by a degree of success, which had never been previously witnessed, and which infused quite a new spirit into this most interesting branch of surgery. Subjects, from eighteen months to four years old, received most benefit from Mr. Saunders's operations; and, if any intermediate time be selected, Dr. Farre (the editor of this gentleman's publication) is inclined to recommend the age of two years. "The parts have then attained a degree of resistance, which enables the surgeon to operate with greater precision, than at an earlier period; yet, the capsule has not become so tough and flexible, as it does at a later period, after the lens has been more completely absorbed.

"But, this is not the greatest, although a considerable advantage of an early operation, for, in cases, in which the patient has no perception of external objects, the muscles acquire such an inveterate habit of rolling the eye, that, for a very long time after the pupil has been cleared by an operation, no voluntary effort can control this irregular motion, nor direct the eye to objects with sufficient precision for the purpose of distinct and useful vision. The retina too by a law, common to all the structures of an animal body, for want of being exercised, fades in power. Its sensibility, in many of the cases, cured at the ages of four years and under, could not be surpassed in children, who had enjoyed vision from birth; but, at eight years, or even earlier, the sense was evidently less active; at twelve, it was still more dull; and from the age of fifteen and upwards, it was generally very imperfect, and sometimes the mere perception of light remained. But, these observations do not apply to those congenital cataracts, in which only the centre of the lens and capsule is opaque, the circumference being transparent, for, in those, the retina is exercised by a perception, although an imperfect one, of external objects, the motions of the muscles, which direct the globe, are associated, and an absorption of the lens does not take place: therefore, in this variety of the disease, the argument in favour of an early operation, is not so much a medical, as a moral one—it is preferable for the purposes of education and enjoyment." (*Saunders on Diseases of the Eye, p.* 153—155.)

Besides Mr. Saunders, several other surgeons of the present day have become zealous advocates for operating upon the cataracts of children. Even Mr. Ware, one of the ablest partisans of extraction, strongly recommended before his death, the use of the needle in the congenital cataract of infants and children. His mode of operating, I shall hereafter notice. Mr. Gibson, of Manchester, has likewise urged the propriety of couching young subjects, and fixes on the age of six months, as preferable to that of two years. "Whatever objections (says he) have been urged against the safe and effectual use of the couching needle in infants, have always appeared to me so slight, and so easily surmountable, that, without inquiring particularly into the real state of the question, I have long concluded in my own mind, that the same motives, which would induce an operator to couch a cataract at any period of adult life, would equally lead him to perform that operation at any earlier period, when a cataract might exist. Acting upon this presumption, *I have operated upon children of all ages, for ten years past.*" (See *Edinb. Med. and Surgical Journal, Vol.* 7, *p.* 394.)

Mr. Gibson's paper being dated June, 1811, we are of course given to understand, that he has pursued this practice from the year 1801, and he asserts that his experience has embraced a considerable number of cases.

"In performing the operation of couching infants, it has always appeared to me, (says this gentleman), that the advantages to be gained by restoring vision at so early a period, are so important, as to bear down any obstacles which may occasionally be opposed to the safe use of the needle. Even the risk of deranging the figure of the pupil forms no solid objection to its use; and may always be avoided by steadiness and good management. Should even a slight change in its figure be produced, it is seldom in the least detrimental to distinct vision, and can scarcely be considered a blemish in the eye of any one; except, perhaps, in that of a geometrician; who may not easily reconcile to himself the presence of an oval opening, where one of a circular form should exist. It may farther be observed, that, if an operator cannot depend upon his management of the eye, so as to render it steady by the introduction of the couching needle, he can avail himself of the assistance of a speculum to restrain its motions.

"The following observations will apply principally to infants under twenty months old. The advantages, which an operator possesses, in operating upon a child of this age, as compared with a child of three years old, or upwards, are important. An infant is not conscious of the operation intended: it is free from the fears created by imagination, and can oppose very feeble resistance to the means employed to secure it with steadiness. At an early age, it has not acquired the power of retracting the eye deep in the socket, so that the operator has always a good prospect of introducing the couching needle with ease, by watching a proper opportunity. The eye has not, at this time, acquired the unsteady rolling motion, which, after a few years, is so common and remarkable in children born blind, or reduced to that state soon after birth. So that this impediment to the easy introduction of the needle does not exist in infants a few months old. The operator also has it in his power to administer a dose of opium, sufficient to render the steps necessary to expose the eye, almost entirely disregarded by his patient. With respect to the state of the eye itself, but, particularly, that of the cataract, this is more favourable for the operation, than at any future period of life. *In infants, the cataract is generally fluid*, and merely requires the free rupture of its containing capsule, which is in that case generally opaque. The capsule, however, is tender, and easily removed by the needle, so as to leave an aperture sufficiently large for the admission of light. The milky fluid, which escapes from the capsule, is soon removed by absorption. If, on the other hand, (says Mr. Gibson) the cataract should be soft, it is generally of so pulpy a softness, that the free laceration of the anterior part of its capsule, and the consequent admission of the aqueous humour, ensures its speedy dissolution, and disappearance, without the necessity of a second operation. Should the cataract happen to be hard, there will be no more difficulty in depressing it, than in an adult. So uniformly favourable is the state of the cataract to the success of the operation, that I may venture to pronounce, that an operator of common experience and expertness, will seldom fail of success, if he can, in an adult, depress a hard cataract, or rupture the containing capsule, and break down the substance of a soft, or fluid cataract when it occurs.

"Such (continues Mr. Gibson) are the advantages, derived from the age of the patient, and state of the eye, which would induce an operator to use the couching needle a few months after birth. If, however, a surgeon had even difficulties to encounter, which do not occur in adults, surely the invaluable benefit, conferred by enabling an infant to become an intelligent being, like other children, instead of remaining in a state approaching to idiotism, would incline him to run some risk of failure, and to make more than common exertion, especially as there is little chance of injuring the eye, when proper cautions are used. Yet, so important a consideration appears to have had little influence upon oculists, and hence, many children have been doomed to years of darkness, happy in the estimation of their parents and friends, if they could distinguish black from white; or discern any perceptible difference between the brightness of the sun, and the glimmering of a tallow candle.

"These advantages, which an operator will possess, when he attempts the removal of a cataract in a child of a few months old, are peculiar to that period. In proportion as the age of the patient advances, until he arrives at the age of discretion, and can estimate, in some measure, the value of sight, by feeling its loss, the difficulties, opposed to the use of the couching needle, increase. His fears of the operation, the unsteadiness of the eye, and his power of retracting it within the orbit, present considerable, but not insuperable obstacles: such, however, as every surgeon would willingly dispense with, if he had it in his power.

"Before an operation, at an early age is recommended, the practitioner ought (as at any other age) to ascertain, that the cataract is not complicated with a defective state of the retina, or with a complete amaurosis. Such cases are by no means uncommon. Some years ago, I recollect to have seen five or six children, the families of two sisters, who were all totally blind, and in an idiotic state, with cataracts accompanied by amaurosis." (*Gibson Op. et loco cit.*)

I find in this gentleman's paper, also, some arguments, which have been repeated in Mr. Saunders's work. "Few practitioners, at all conversant with cases of blindness from birth, will deny, that it is highly probable, that the eye may lose a considerable part of its original powers, from the mere circumstance of its having so long remained a passive organ. Hence, probably it happens, that, in some cases of congenital cataract, the only benefit conferred on the patient, by an operation, is that of enabling him to find his way in an awkward manner, and to discriminate the more vivid colours. Such patients have never been able to discern small objects, or to judge, in any useful degree, of figure, or magnitude; I am well aware, however, says Mr. Gibson, that, in some rare instances, such a defective state of the eye exists from birth.

"Another circumstance, which must have attracted the attention of oculists, is, that, in a few years, the eye of a patient born blind, acquires a restless and rolling motion, which is at length so firmly established by habit, that he has little controul over it. This motion unfortunately continues, for a considerable time, after sight has been restored to such a person, and is a very material obstacle to the early attainment of a knowledge of the objects of vision. He cannot fix his eye steadily upon one point for a moment, and the inconvenience, which arises from this unsteadiness, is, to such a person, occasionally as great a bar to the distinct view of an object, as the unsteady motion of the same object would be to one, whose vision is perfect. This inconvenience any one can appreciate, and, as far as I know, it is completely avoided by restoring sight at an early age."

As a motive for operating on infants, Mr. Gibson also comments on the loss of those years, which ought to be spent in education. (See *Edinb. Med. and Surgical Journal*, *Vol.* 7, *p.* 394—400.)

### TREATMENT OF THE CATARACT.

The principal external remedies that have been employed in the cure of the cataract, are, bleeding, cupping, scarifying, setons, issues, blisters, and fumigations; and the principal internal remedies are, aperients, incisives, emetics, cathartics, sudorifics, cephalics, and sternutatories. Preparations of eye-bright, millepedes, wild poppy, henbane, and hemlock, have also been much commended, as specifics for the disorder.

Scultetus asserts, that he checked the progress of a cataract, by applying to the eye the gall of a pike, mixed with sugar; and Spigelius, as we are informed by the same author, boasted of having successfully used, for this purpose, the oil of the celpout (*mustela fluviatilis.*)

Cataracts are said to have been cured in venereal patients, while under a course of mercury. It is probable, however, that many such cases have been mere opacities of the cornea, which have been mistaken for cataracts. Baron Wenzel placed no reliance whatever in the power of any remedies to dissipate a cataract, and, as he had remarked their inefficacy in numerous instances, he felt authorized in declaring, that internal remedies, either of the mercurial, or any other kind, are inadequate to the cure of this disorder; and equally so, whether the opacity be in the crystalline, or in the capsule, whether incipient, or advanced.

Although Mr. Ware coincides with Wenzel, in regard to the uncertainty of all known medicines to dissipate an opacity, either in the crystalline, or its capsule, or even to prevent the progress of such opacity, when once begun, yet, many cases have proved, that the powers of nature are often sufficient to accomplish these purposes. The opacities, in particular, which are produced by external violence, Mr. Ware has repeatedly seen dissipated in a short space of time, when no other parts of the eye have been hurt. In such cases, the crystalline lens has generallybeen absorbed, as is proved by the benefit, which has afterwards been derived from deeply convex glasses. In some of these cases, though the crystalline has been dissolved, the greater part of the capsule has remained opaque, and the light has been transmitted to the retina only through a small aperture, which has become transparent in its centre. Instances are also not wanting, in which cataracts, formed without any violence, have been suddenly dissipated in consequence of an accidental blow on the eye. The remedies, which Mr. Ware has found more effectual, than others, have been the application to the eye itself of one, or two drops of æther, once, or twice, in the course of the day, and the occasional rubbing of the eye, over the lid, with the point of the finger, first moistened with a weak volatile, or mercurial liniment.

Cataracts are usually cured, either by removing the opaque lens, from the axis of vision by means of a needle; or by extracting the lens from the eye, through a semicircular incision, made at the lower part of the cornea. The first operation is termed *couching*, or *depression of the cataract;* the second is named *extraction*. Some account of the congenital cataract, and method of operating upon children, will be found in the future part of the present article.

### EXTRACTION OF THE CATARACT.

As soon as it was fully proved, that the true cataract was an opacity, of the crystalline humour, that the loss of sight would not be occasioned by the removal of this humour, that the cornea may be divided without danger, and that, if the aqueous humour be discharged, it will be quickly regenerated, the mode of cure, by extracting the cataract out of the eye, would naturally present itself to the mind. (*Wenzel.*)

Freytag was the first operator, who made an attempt to extract the cataract, about the close of the 17th century. After him Lotterius of Turin, performed this operation. Daviel first communicated this method to the public. And the ingenuity and industry of Wenzel brought this mode of operating to a state of perfection never before attained. (*Brambilla Instrumentarium Chirurgicum Austriacum*, 1782, *p.* 71.)

Wenzel's knife resembles the common lancet employed in bleeding, excepting that its blade is a little longer, and not quite so broad. Its edges are straight, and the blade is an inch and a half (eighteen lines) long, and a quarter of an inch (three lines) broad, in the widest part of it, which is at the base. From hence it gradually becomes narrower towards the point; so that this breadth of a quarter of an inch extends only to the space of about one-third of an inch from the base; and, for the space of half an inch from the point, it is no more than one-eighth of an inch broad.

The lower edge of the knife, by which is meant, that which is lowest during the operation, is sharp through the whole length of the blade. At the distance of a quarter of an inch from the base, this lower edge has a slight projection, which is of use in making the section through the cornea. The upper edge Wenzel divides into three portions. For the space of five-sixths of an inch from the basis, this edge is blunt, and very slightly flattened. For the space of half an inch, or rather six lines and a half, further towards the point, it is blunt and rounded; although to the naked eye this part appears sharp, on account of its being very thin. And the extremity of this edge, to the extent of one-eighth of an inch from the point, is keen, like the lower edge, in order to facilitate the conveyance of the instrument through the cornea.

The swelling in the middle of the blade is merely intended to prevent the instrument from breaking. The handle, in which the blade is fixed, has eight sides, which are alternately large and small. This form enables the operator to hold the instrument more firmly, which is not so apt to turn round in the hand. It is generally three inches and two-thirds in length, and, from two lines, to two and a half, in thickness. The blade is so fixed in the handle, that the two sides of the former lie parallel with the broadest side of the latter. On the upper side of the handle, which answers to the upper, or blunt edge, of the knife, a small mark is placed, which directs the proper manner, in which the instrument should be held in performing the operation.

The shape of this knife is well calculated to effect the division of the cornea, with the utmost ease and safety, as it cuts this membrane, in proportion as it enters the eye. (*Wenzel.*)

The knife employed by Mr. Ware, is, in regard to its dimensions, not unlike the instrument employed by the Baron. The principal difference between them is, that Mr. Ware's knife is less spear-pointed; in consequence of which, when this latter instrument has pierced through the cornea, its lower, or cutting edge will sooner pass below the inferior margin of the pupil, than the knife used by Wenzel. On this account, Mr. Ware is of opinion, that the iris will be less likely to be entangled under the knife, which he recommends, than under Wenzel's, when the instrument begins to cut its way downwards, and the aqueous humour is discharged. Mr. Ware particularly advises great care to be taken to have the knife increase gradually in thickness from the point to the handle; by which means, if it be conducted steadily through the cornea, it will be next to an impossibility, that any part of the aqueous humour should escape, before the section is begun downwards; and, consequently, during this time, the cornea will preserve its due convexity. But, if the blade should not increase in thickness from the point; or if it be incurvated much in its back, or edge, the aqueous humour will unavoidably escape, before the puncture is completed; and the iris, being brought under the edge of the knife, will be in great danger of being wounded by it. (*Ware.*)

Baron Wenzel considers all instruments, invented for fixing the eye, quite unnecessary: they render the operation more complicated, more dreadful to the patient, more embarrassing to the operator, and they are very liable to irritate and wound the eye. If the above oculist could approve of any kind of speculum, he should give the preference to Rumpelt's instrument, which is nothing more than a thimble, at the end of which is a sharp pointed instrument, like the pique of Pamard. The thimble is to be placed on the middle finger of the operator, and it has the advantage of not obstructing the use of the forefinger, but leaves it at liberty to keep down the lower eyelid.

The pressure, occasioned by all contrivances for fixing the eye, is a serious objection to their employment, as such pressure is apt to cause a sudden protrusion and loss of great part of the vitreous humour. (*Wenzel.*)

Mr. Ware coincides very much with Wenzel on the subject of specula. At the same time, he remarks, that, in some instances of children born with cataracts, he has been obliged to fix the eye with a speculum; without the aid of which, he has found it totally impracticable to make the incision through the cornea, with any degree of precision, or safety. His speculum is an oval ring, the longest diameter of which is about twice as long as the diameter of the cornea, and the shortest about half as long again as this tunic. Annexed to the upper rim of the speculum is a rest, or shoulder, to support the upper eyelid; and, by its lower rim, it is fixed to a handle of such a length, and bent in such a way, as may render it convenient to be held. (*Ware.*)

When the patient is to undergo the operation, he should be seated in a low chair, before a light, which is not too bright, and, which, consequently, does not occasion too great a contraction of the pupil. The sound eye being covered with a compress, an assistant, placed behind, must hold the patient's head, and support it on his breast. With the forefinger of the hand that is at liberty, he is then to raise the upper lid of the eye to be operated upon, and gently press the tarsus, with the extremity of the finger, against the upper edge of the orbit, avoiding all undue pressure on the eye.

The operator is to be seated in a chair, a little higher, than that of the patient. The eyes naturally turning towards the light, he is to place the patient's head obliquely at a window, so that the eye to be operated upon may be inclined towards the outer angle of the orbit. This position will enable the operator to bring out the knife, on the inner side of the cornea, opposite to the part, where it pierces this tunic, more exactly, than he would otherwise be able to do. The operator is to rest his right foot on a stool, placed near the patient, that his knee may be raised high enough to support the right elbow, and to bring the hand, with which he holds the knife to a level with the eye, on which he is to operate. He is then to take the cornea knife in his right hand, if it be the left eye, on which he is to operate, and, *vice versa*, in the left hand, if it be the right eye. The knife is to be held like a pen in writing, and the hand is to rest steadily on the outer side of the eye, with the little finger, separated a little from the rest, on the edge of the orbit. In this position, the operator should deliberately wait, till the eye becomes quite still. (*Wenzel.*)

When the eye is perfectly quiet, and so turned towards the outer angle, that the inner and inferior part of the cornea can be distinctly seen, through which Wenzel recommends the point of the knife to be conveyed, the operator is to plunge the knife into the upper and outer part of this tunic, a quarter of a line distant from the sclerotica, in such a direction, that it may pass obliquely from above, downwards, parallel to the plane of the iris. At the same time, the operator must depress the lower lid with his fore and middle fingers, taking care to avoid all pressure on the eyeball. (*Wenzel.*)

Mr. Ware does not approve of this plan of leaving the eye unfixed, while the incision is made through the cornea. The danger likely to arise from undue pressure, can only take place, after the instrument has made an opening into the eye: but, the pressure, which Mr. Ware advises, in order to fix the eye, is to be removed the instant the knife is carried through the cornea, and before any attempt is made to divide this tunic downwards. To understand this subject better, however, the reader should know, that Mr. Ware divides the incision of the cornea into two distinct processes; the first of which may be called *punctuation*, and the second *section*. So long, says Mr. Ware, as the knife fills up the aperture, in which it is inserted, that is, until it has passed through both sides of the cornea, and its extremity has advanced some way beyond this tunic, the aqueous humour cannot be discharged, and pressure may be continued with safety. The punctuation of the cornea being completed, the purpose of pressure is fully answered; and, if such pressure be continued, when the section of the cornea begins, instead of being useful, it will be hurtful. To avoid all bad effects, Mr. Ware recommends the cornea to be cut in the following way.

The operator is to place the fore and middle finger of the left hand, upon the tunica conjunctiva, just below, and a little on the inside of the cornea. At the same time, the assistant, who supports the head, is to apply one, or, if the eye projects sufficiently, two of his fingers, upon the conjunctiva, a little on the inside and above the cornea. The fingers of the operator and assistant, thus opposed to each other, will fix the eye, and prevent the lids from closing. The point of the knife is to enter the outside of the cornea, a little above its transverse diameter, and just before its connexion with the sclerotica. Thus introduced, it is to be pushed on slowly, but steadily, without the least intermission, and in a straight direction, with its blade parallel to the iris, so as to pierce the cornea towards the inner angle of the eye, on the side, opposite to that, which it first entered, and till about one-third part of it is seen to emerge beyond the inner margin of the cornea. When the knife has reached so far, continues Mr. Ware, the punctuation is completed. The broad part of the blade is now between the cornea and the iris, and its cutting edge below the pupil, which of course is out of all danger of being wounded. As every degree of pressure must now be taken off the eyeball, the fingers, both of the operator and his assistant, are instantly to be removed from this part, and shifted to the eyelids. These are to be kept asunder by gently pressing them against the edges of the orbit; and the eye is to be left entirely to the guidance of the knife, by which, says Mr. Ware, it may be raised, depressed, or drawn to either side, as may be found necessary. The aqueous humour being now partly, if not entirely evacuated, and the cornea of course rendered flaccid, the edge of the blade is to be pressed slowly downward, till it has cut its way out, and separated a little more, than half the cornea from the sclerotica, following the semicircular direction, marked out by the attachment of the one to the other.—(*Ware.*)

As soon as the point of the knife had arrived opposite the pupil, Wenzel used to incline it gently backward, and thus puncture the capsule of the crystalline. But, Mr. Ware very properly objects to this method of opening the capsule with the instrument used for cutting the cornea, and at the same time. The plan may exhibit dexterity; but, is of no use, and is often attended with considerable danger of wounding the iris.

In the eyes of some persons, the iris is convex, and it is almost impossible to complete the section of the cornea, without entangling the iris under the edge of the knife, unless a particular artifice be adopted. Wenzel, in this circumstance, recommends gently rubbing the cornea downward with the finger; one of the most important directions, according to Mr. Ware, in the Baron's whole book.

Wenzel imputed several advantages to the oblique manner, in which he used to divide the cornea. The best modern oculists, however, do not attribute any superior uses to this method, and consequently do not imitate it.

If the edge of the knife should incline too much forward, and its direction be not altered, the incision in the cornea will be too small, and terminate almost opposite the pupil. In this case, there will be great difficulty in extracting the cataract, and the cicatrix afterwards will often obstruct sight. If, on the contrary, the edge of the instrument be inclined too much backward, and its direction be not changed, the incision will approach too near the part, where the iris and sclerotica unite, and there will be great danger of wounding one, or the other of these coats of the eye. Both these accidents may be prevented by gently rolling the instrument between the fingers, until the blade takes the proper direction. (*Wenzel.*)

Mr. Ware has seen operators, through a fear of wounding the iris, introduce and bring out the instrument at a considerable distance before the union of the cornea and sclerotica; in consequence of which, the incision from one side of the cornea to the other has been made too small to allow the easy extraction of the cataract, although from above downward, it was fully large enough for this purpose. Mr. Ware has also sometimes observed, that though the punctuation of the cornea, from side to side, has been properly conducted, and its section, afterwards, to all appearance, effectually completed, yet, on account of the frictions, employed to disengage the iris from the edge of the instrument, the knife, in cutting downward, has been carried between the layers of the cornea, and, consequently, though the incision has appeared externally, to be of its proper size; internally, it has been much too small for allowing the cataract to be easily extracted. In this case, the incision must be enlarged, by means of a pair of curved blunt-pointed scissars, which should be introduced at the part, where the knife first entered the cornea. (*Ware.*)

After the knife has pierced through the cornea, and while it is cutting its way downward, the assistant, to whose care the upper eyelid is entrusted, is gradually to let it drop, in order to prevent the cataract from escaping too hastily. Then the whole charge of the eye devolves solely on the operator, who is to solicit the extraction of the cataract by gentle pressure on the upper part of the globe, the capsule of the crystalline having been previously opened.

Wenzel himself does not recommend opening the capsule of the crystalline, in every instance, at the same time, that the cornea is cut. In cases, where the pupil is much contracted, as well as in those, where the muscles of the eye and eyelids are easily thrown into convulsions, it is improper, says he, to puncture the capsule when the section is made through the cornea. This is also improper when the space, between the crystalline, and the iris, termed the posterior chamber, is large. In all such cases, Wenzel acknowledges, that it is better simply to divide the cornea in the first instance, and then to puncture the capsule with a different instrument.

Wenzel and his father used to employ, for this purpose, a flat needle, one line, that is, one twelfth part of an inch, in diameter, having its cutting extremity a little incurvated. This needle, which should be made of nealed gold, that its pliability may allow the operator to bend it in different directions, as occasion requires, is fixed in a handle, two inches and a half in length, and similar to that of the cornea knife. At the other extremity of the same handle a small curette, or scoop, is fixed, made also of nealed gold, which is of use to extract the cataract.

When the crystalline, dislodged from its capsule, protrudes through the wound in the cornea, its removal from the eye may sometimes be assisted by the use of the above needle; and afterwards the opaque and glutinous matter, remaining, must be removed by means of the curette.

It is always advisable, after the operation, gently to rub the anterior part of the cornea over the lids, either with the thumb or the curette. This process usually collects in the centre of the pupil some small fragments of opaque matter, which the crystalline leaves behind it, and which, if not taken away with the curette, might give rise to a particular kind of secondary cataract. The curette is also of use for replacing the iris, a portion of which membrane occasionally comes through the incision in the cornea. (*Wenzel.*)

Sometimes the cataract is hindered from coming out, on gentle pressure being made, in consequence of adhesions. Wenzel recommends these to be broken by means of the golden needle, introduced under the cornea, and applied in different directions, according as the case requires, and more especially round the circumference of the crystalline.

Sometimes, when the capsule of the crystalline is destroyed, and the crystalline itself is perfectly free, this humour plunges to the inferior part of the vitreous humour, leaving only its upper edge visible through the pupil. The hyaloid membrane is also most commonly destroyed, and the vitreous humour in a state of fluidity. All pressure, therefore, on the eyeball, must be avoided, since this would produce a large evacuation of the vitreous humour. The only method is to introduce through the pupil, a small steel hook to take hold of the crystalline, which, in this case, is often very small, and with this instrument to extract it from the eye. (*Wenzel.*)

When the capsule used to become opaque after the operation, so as to form, what is termed, the secondary membranous cataract, Wenzel, after dividing the cornea, used to remove the opaque substance, by means of a small pair of forceps.

After the operation, no fluid application, according to Wenzel, should be made to the eye. It should be simply covered with a dossil of lint; over which a dry compress should be applied. The dressings should in general be removed every day.

Mr. Ware, however, approves of fluid applications. He has found, that a dossil of lint, steeped in plain water, or brandy and water, and covered with the spermaceti, or saturnine cerate, and removed once every day, is the most easy and convenient dressing, that can be applied after the operation. The cerate over the lint prevents the latter, when impregnated with the discharge, from becoming stiff, and irritating the lids. Mr. Ware thinks the mode of applying the compress and bandage over the eye, a circumstance of no small importance, because, if too loose, the dressings are very apt to slip off, and, consequently, to press unequally and injuriously on the eye; and, if too tight, the undue pressure will excite pain and inflammation, and even force out some of the vitreous humour. Mr. Ware's compress is made of soft linen, folded, two or three times, wide enough to cover both eyes, and sufficiently long to extend from the upper part of the forehead to the lower part of the nose. This he pins at the top of the patient's nightcap; and its lower part, which is divided in the middle, to allow the nose to come through it, he lays loosely over the eyes. The bandage, also made of old linen, and as broad as six fingers, he carries round the head over the compress, and pins to the side of the nightcap moderately tight. A slip of linen is afterwards carried under the chin and pinned, at each end, to the side of the bandage, to prevent it from slipping upwards. (*Ware.*)

The patient should lie continually on his back, after the operation, as this posture has a tendency to prevent the escape of the humours.

Mr. Ware has published a very able enquiry into the causes preventing the success of extraction of the cataract.

The first, which he considers, is making the incision through the cornea too small. In this circumstance a degree of violence will be required to bring the cataract through the wound; and, if the cataract be not altered in its figure, the wound will be forcibly dilated, and the edge of the iris compressed between the cornea and the cataract. In this way, either some of its fibres may be ruptured, or it may be otherwise so much injured, as to excite a considerable degree of inflammation, and even induce, in the end, a closure of the pupil.

This accident may arise from the operator's cutting the cornea, without being able to see exactly the position of this membrane, in consequence of the eye having turned inward, owing to its not being properly fixed. The fault may also proceed from the incision having been begun below the transverse diameter of the cornea. In this manner, nine-sixteenths, or rather more than half of the circumference of this membrane, will not be divided; which extent the incision ought always to occupy, in order to allow the cataract to be extracted with facility.

When however the cornea is remarkably flat, and the iris projects unusually forward in the anterior chamber, Mr. Ware recommends including only one-third of the cornea in the first incision, and afterwards enlarging the aperture, on the outer side, by means of curved scissars.

Whenever the wound in the cornea is made too small, it should always be enlarged before proceeding further in the operation; and this can be best accomplished with a pair of curved blunt-pointed scissars, on the outer side of the cornea, where the knife first made its entrance.

Taking care to fix the eye in Mr. Ware's way, is certainly of great consequence in hindering the wound in the cornea from being made too small.

Wounding the iris with the cornea-knife, is the second accident, which Mr. Ware considers. The principal cause seems to him to be a discharge of the aqueous humour, before the knife has passed through the cornea low enough to hinder the lower part of the iris, which forms the inferior rim of the pupil, from getting beneath the edge of the instrument. The escape of the aqueous humour may be owing to some inaccuracy in the shape of the knife, or unsteadiness in introducing it. The falling of the lower part of the iris under the edge of the knife, Mr. Ware believes, cannot always be prevented by the utmost skill, or precaution of the operator. Happily, however, says he, we have been taught, that the iris may be reinstated, after it has been thus displaced, and without suffering any injury, by applying gentle frictions on the cornea, over the entangled part, with the point of the finger.

By unsteadiness in passing the knife, Mr. Ware means, that the knife may not only be suffered to make a punctuation through this tunic, but, that its edge may, at the same time, be unintentionally pressed downward, so as to make an incision likewise; in consequence of which downward motion of the knife, an aperture must unavoidably be left in the cornea, through which the aqueous humour will escape. If the cornea-knife increase through its whole length, both in width and thickness, and if it be merely pushed through the cornea, no space will be left, through which any fluid can escape.

The third accident, noticed by Mr. Ware, is the escape of the vitreous humour. The common occasion of this occurrence is the undue application of pressure. It may take place, either when the incision is made through the cornea, or at the time of extracting the cataract out of the eye. Some eyes are subject to spasm; which renders them much more liable to this accident. To prevent it, Mr. Ware recommends every kind and degree of pressure to be taken from the eye, before the knife has completely cut its way through the cornea. And, as soon as the knife has proceeded sufficiently low to secure the iris from being wounded, the operator should not only take heed, that his own fingers do not touch the eye, but should also direct the assistant, who supports the upper lid, to remove his fingers entirely from this part. The assistant seldom need make any pressure on the globe of the eye: however, when there is room for one of his fingers to be placed on the inner and upper part of the globe, without interfering with those of the operator, the method may be followed, in order to make the eye still more fixed. But immediately the punctuation of the cornea is completed, the assistant's finger should always be entirely removed, both from the eyelids and eye itself.

Notwithstanding the upper lid is left thus free, there will be sufficient space between it and the lower lid, to allow the progress of the knife to be seen; and, in finishing the wound, the operator should depress the lower lid with great gentleness.

The vitreous humour may also be lost,

in consequence of opening the capsule of the lens nearer the circumference, than the centre of the pupil. As the crystalline is both thinner and softer at that part, the instrument will be liable to pass through both sides of the capsule, and enter the vitreous humour. This humour having no longer any barrier to its escape, is liable to be forced out by the action of the eyelids alone; and, when pressure is afterwards made, to bring the cataract through, a much greater quantity will be lost, and the cataract, instead of coming forward, will recede from the pupil. The only way to extract it now, is, by having the upper lid gently raised by an assistant, (a rare instance, in which this is necessary after cutting the cornea) while the operator, either with the fore-finger of the left hand, or with the blunt end of the curette, applied beneath the incision in the cornea, prevents the cataract from sinking further. Then, with his right hand, let him introduce a hook under the flap of the cornea, and with its point carefully entangle the cataract, and bring it away.

To prevent, however, such difficulties, Mr. Ware very judiciously advises never attempting to puncture the capsule, until the whole pupil is in view. This gentleman is in the habit of opening the capsule with a gold-pointed needle, arched towards its extremity. Wenzel's needle, for this purpose, is flat at its extremity: Mr. Ware's is pointed: and this is their only difference. The latter introduces his instrument under the flap of the cornea, with its arched part uppermost, until its point is on a level with the centre of the pupil. The end of the instrument should then be turned inward, and gently rubbed on the capsule of the crystalline, until it pierces it. In a few instances, Mr. Ware has found the capsule so tough, that the point of the gold needle would not enter it, and he has been obliged to use a sharp steel instrument, of the same shape as the gold-pointed one.

The vitreous humour may also be lost, at the time of extracting the cataract, and the usual cause is an undue application of pressure. All violent pressure is quite unnecessary for forcing out the cataract, when the wound in the cornea is sufficiently large. When the wound is too small, it should be enlarged as above directed. If pressure be continued at all after the cataract is extracted, the capsule of the vitreous humour will certainly be ruptured, and some of this part of the eye protruded. Pressure may even rupture the capsule of the vitreous humour, before the cataract is brought through the incision in the cornea; and the same consequences will ensue, and the same practice be necessary, as in the case, in which the operator has unskilfully opened the capsule of the vitreous humour with the needle, in attempting to open that of the lens.

In taking away fragments of opaque matter, remaining behind, by means of the curette, great care is requisite to avoid wounding the posterior part of the capsule of the crystalline with the end of the instrument, so as to open a way for the escape of the vitreous humour.

The vitreous humour may, indeed, be forced out, after the extraction of the cataract, merely by a spasmodic action of the eyelids. On this subject, Mr. Ware, after hinting his suspicion, that, in a case of this kind, which he saw, the assistant's keeping up the lid contributed to the event, repeats his advice, "that the upper eyelid should be raised solely by the fingers of the left hand of the operator," after cutting the cornea.

Mr. Ware seems to think, that more evil has resulted from the operator's being deterred, by the readiness, with which the vitreous humour continues to start out, from ascertaining, that all the fragments of the cataract are removed, and that the whole of the iris has resumed its position, than from the mere loss of the vitreous humour, which is quickly regenerated.

Mr. Ware afterwards takes notice of the accident of extracting only a part of the cataract, and leaving the remainder behind. He is an advocate for removing all opaque substances from the pupil, except an extreme degree of irritability, to which some eyes are subject, should render the introduction of every sort of instrument, after the cataract is extracted, difficult and dangerous. Mr. Ware usually removes opaque portions of the cataract by means of a curette; and, occasionally, when the opaque substance has been large, and has adhered to the capsule, he has been obliged to extract it with small forceps. Before finishing the operation, Mr. Ware approves of always rubbing the end of the finger gently on the fore part of the eye, over the eyelids; which proceeding tends to bring in view any opaque matter, which may previously lie behind the iris. Mr. Ware relates a case, proving, that such opacities as cannot be removed in the operation, are capable of being absorbed.

This gentleman says, that an opacity of the capsule can be the only reason for removing it. The anterior part, also, can alone become the object of the operator's attention: its posterior part is necessarily hidden, while the cataract remains in the eye, and afterwards, if discovered to be opaque, it is so closely connected with the capsule of the vitreous humour, that Mr. Ware believes it cannot be removed by any instrument, without hazarding a destructive effusion of this humour.

When, however, the opaque lens, is accompanied with an opacity in the front part of the capsule, Mr. Ware recommends the following plan. After cutting the cornea, as usual, a fine-pointed instrument, somewhat smaller in size than a round couching needle, and a little bent towards the point, should be introduced under the flap of the cornea, with its bent part upward, until its point is parallel with the aperture of the pupil. The point should then be turned toward the opaque capsule, which is to be punctured by it, in a circular direction, as near to the rim of the pupil as the instrument can be applied, without hurting the iris. Sometimes, the part included within the punctures, may be extracted on the point of the instrument; and, if this cannot be done, it should be removed with a small pair of forceps. The lens, whether opaque, or transparent, should next be extracted, by making a slight pressure with the curette, either above, or below, the circumference of the cornea.

Mr. Ware afterwards considers the bad consequences of allowing foreign bodies of any kind, after the operation, to press unequally on the globe of the eye; comprehending, under this head, the intervention of the edge of the lower eyelid between the sides of the divided cornea; the inversion of the edge of the lower eyelid; and the lodgment of one, or more, loose eyelashes on the globe of the eye.

To prevent the first accident, every operator, before applying the dressings, should carefully depress the lower eye-lid; and, before he suffers the lid to rise, should take care, that the flap of the cornea be accurately adjusted in its proper position; and, that the upper lid be dropped, so as completely to cover it. After this, the eyelids should not be opened again, for three, or four days, that is, until there is good reason to suppose the wound in the cornea closed. (*Ware.*)

The inversion of the lower eyelid is hurtful, in consequence of its making the eyelashes rub against the eye. These should be extracted the day before the operation. For the mode of effecting a permanent cure, see *Trichiasis.*

Besides the danger, to which the eye is exposed, from the inversion of the edge of the lid, the eye may receive injury from the improper position of the eyelashes alone; one, or more of which, during the operation, may happen to bend inwards; or, becoming loose, may afterwards insinuate themselves between the inside of the lid and the eye. An eyelash bent inward, should be rectified; if broken off and loose, it should be removed, before dressing the part.

Mr. Ware lastly considers prematurely exposing the eye to a strong light. He censures the plan of opening the eyelids, within the first two or three days after the operation, because the stimulus of the light increases the ophthalmy, and the method is apt to disturb the wound in the cornea, before it is closed. Mr. Ware, however, wishes it not to be inferred, that he is an advocate for long confinement after the operation. His mode is to keep the patient wholly in bed, and to direct him to move his head, as little as possible, for the first three days after the operation, During this time, a dossil of wet lint is kept on his eyes, covered with a saturnine plaster, compress, and bandage, as already described. The dressing is renewed once every day, and the outsides of the eyelids washed with warm water in winter, and cold in summer. At each time of dressing, the skin of the lower lid is drawn gently down to prevent any tendency to an inversion. Animal food is prohibited, and the patient enjoined not to talk much. On the fourth day, he is permitted to sit up, for two, or three hours, and, if he has had no stool since the operation, a mild opening medicine is now administered. On the fifth, the time of his sitting up is lengthened, and, presuming that the wound in the cornea is now closed, Mr. Ware usually examines the state of the eye. After this, no dressings need be applied in the day-time, care being taken to defend it from a strong light, by a pasteboard hood, or shade, and by darkening the room, so that no inconvenience is felt. The patient may now also look, for a short time, at large objects. The following part of the treatment need interfere very little with the wishes of the patient, unless unexpected accidents should occur. (*Ware.*)

Mr. Travers has tried in particular cases a sort of combination of extraction and couching. "Circumstances unfavourable to the operation of extraction (says this gentleman) are occasionally combined with forms of cataract, to which it is otherwise well adapted. One of the most formidable of these, as it appeared to me, when I commenced the practice, was the convexity of the iris, and consequent narrowness of the anterior chamber, where the lens was bulky and of firm consistence. It is evident, that this figure of the iris will either materially limit the section of the cornea, or expose the iris to be wounded in the section. Frequently meeting with this difficulty induced me to vary the mode of operating thus: I first employed the belladonna to dilate the pupil, and then introducing a small spear-shaped needle behind the iris, I slit the capsule down the front of the lens perpendicularly, and repressed with my needle the superior margin of the lens, by which pressure its inferior margin was raised, and easily tilted over the edge of the dilated pupil into the anterior chamber. Here I left it resting against the cornea, and withdrew my needle. The eye was then closed, and a napkin thrown over it. After a minute or two, the upper lid was gently raised, and I made my section boldly upon the lens, in conformity to the surgical practice of cutting upon an extraneous body previously secured. By the interposition of the lens, the iris was effectually protected, and the cataract readily escaped as soon as the section was completed. This operation, which it will be seen differs from that of extraction as hitherto done, chiefly in having its stages reversed, I performed several times without difficulty and with good success: the patients had no more than ordinary inflammation, and recovered excellent vision. But, in the progress of my experience, I found the pupil vary in its extent of dilatation under the influence of belladonna, and where the external lamellæ of the opaque lens were soft, as in the mixed cataract, I found them separate under the pressure of the needle, which increased the difficulty of throwing the nucleus, as it sunk away from the pupil into the anterior chamber. To remove the fragments of the cataract, it appeared superfluous to make the entire section of the cornea, I therefore carried the knife only half across the chamber, and withdrew it. The fragments floating in the aqueous humour were at once evacuated with it, and upon introducing the scoop, and gently depressing the outer margin of the pupil with the back of it, the remaining portion was readily conducted along its groove, as the contents of an abscess follow the director. The success of this operation, obtained more than once under circumstances nearly similar, the clearness of the pupil, and the perfect state of the iris, furnished a suggestion not to be overlooked, and led to what I am disposed to regard a material improvement in the operation for soft cataracts. I began my operation, having previously dilated the pupil, by the quarter section of the cornea, dipping the point of the knife into the pupil, and freely lacerating the capsule before withdrawing it. The fluid cataract was instantly evacuated with the aqueous humour. The flocculent cataract frequently passed out entire, taking an oblong shape, and the soft caseous cataract piecemeal, through the hollow of the scoop, on gently depressing the margin of the pupil and sclerotic.

"If the pieces were not all evacuated, the introduction of the capsule needle was found sufficient to clear the pupil, or they disappeared in a few days by absorption." (*Travers in Medico-Chirurgical Trans. Vol. 5, p.* 405, *&c.*)

This method has little to recommend it; and there are few surgeons who will not at once discern, that the *dipping* of the point of the knife into the pupil, and the introduction of the scoop to press down the edge of this aperture, must be attended with far more serious danger to the iris, than completing the incision of the cornea and extraction in the common way. The plan was originally proposed and practised, with some little variation, by the late Mr. Gibson of Manchester. (See *B. Gibson's Practical Observations on the Formation of an Artificial Pupil, with Remarks on the Extraction of Soft and Membranous Cataracts through a Puncture in the Cornea.*)

## OF COUCHING, OR DEPRESSION OF THE CATARACT.

This operation not long ago was supposed to consist altogether in removing the opaque lens out of the axis of vision, by means of a needle, constructed for the purpose; but, it is now well known to be frequently effectual on another principle, even when the nature and consistence of the cataract do not admit of the depression of the opaque body. In short, experience fully proves, that the diseased lens, when broken and disturbed with the needle, and especially when freely exposed to the contact of the aqueous humour by a proper laceration of its capsule, is gradually dissolved and removed by the action of the absorbents.

There are two couching needles, which now seem to be preferred to all others: and these are the only ones requiring a description here. I allude to the one used by Mr. Hey; and to that employed by Professor Scarpa.

The length of Mr. Hey's needle is somewhat less than an inch. It would be sufficiently long if it did not exceed seven-eighths of an inch. It is round, except near the point, where it is made flat by grinding two opposite sides. The flat part is ground gradually thinner to the extremity of the needle, which is semicircular, and ought to be made as sharp as a lancet. The flat part extends in length, about an eighth of an inch, and its sides are parallel. From the part where the needle ceases to be flat, its diameter gradually increases towards the handle. The flat part is one-fortieth of an inch in diameter. The part which is nearest the handle, is one-twentieth of an inch. The handle, which is three inches and a half in length, is made of light wood, stained black. It is octagonal, and has a little ivory inlaid in the two sides, which correspond with the edge of the needle.

Mr. Hey describes the recommendations of this instrument in the following terms:

1. "It is only half the length of the

common needle; and this gives the operator a greater command over the motions of its point, in removing the crystalline from its bed, and tearing its capsule. It is also of some consequence, that the operator should know how far the point of his needle has penetrated the globe of the eye, before he has an opportunity of seeing it through the pupil; as it ought to be brought forwards when it has reached the axis of the pupil. Now he may undoubtedly form a better judgment respecting this circumstance, when the length of his needle does not much exceed the diameter of the eye, than when he uses one of the ordinary length, which is nearly two inches. The shortness of the needle is peculiarly useful, when the capsule is so opaque that the point cannot be seen through the pupil.

2. "As this needle becomes gradually thicker towards the handle, it will remain fixed in that part of the sclerotis, to which the operator has pushed it, while he employs its point in depressing and removing the cataract. But the spear-shaped needle, by making a wound larger in diameter, than that part of the instrument, which remains in the sclerotis, becomes unsteady, and is with difficulty prevented from sliding forwards against the ciliary processes, while the operator is giving it those motions which are necessary for depressing the cataract.

"On the same account the common spear-shaped needle may suffer some of the vitreous humour to escape during the operation, whereby the iris and ciliary processes would be somewhat displaced, and rendered flaccid; whereas the needle which I use, making but a small aperture in the sclerotis, and filling up that aperture completely during the operation, no portion of the vitreous humour can flow out so as to render the iris and ciliary processes flaccid.

3. "This needle has no projecting edges: but the spear-shaped needle, having two sharp edges, which grow gradually broader to a certain distance from its point, will be liable to wound the iris, if it be introduced too near the ciliary ligament, with its edges in a horizontal position. I have been informed, that, in an operation performed by one of the most eminent surgeons in the metropolis, now deceased, the iris was divided as far as the pupil. If the operator, in order to avoid this danger, introduces his needle with its edges in a vertical position, he will divide the fibres of the sclerotis transversely, and, by thus enlarging the wound, will increase the unsteadiness of the instrument. Besides, however the needle be introduced, one of its sharp edges must be turned toward the iris in the act of depressing the cataract; and, in the various motions which are often necessary in this operation, the ciliary processes are certainly exposed to more danger, than when a needle is used which has no projecting edge.

4. "It has no projecting point. In the use of the spear-shaped needle, the operator's intention is to bring its broadest part over the centre of the crystalline. In attempting to do this, there is great danger of carrying the point beyond the circumference of the crystalline, and catching hold of the ciliary processes, or their investing membrane, the *membrana nigra.* This accident is the more probable, as the point of the needle must unavoidably be directed obliquely forwards, and this motion, if carried too far, brings the point into contact with the ciliary processes, as they surround the capsule of the crystalline.

"A needle, made according to the figure given in the annexed plate, will pass through the sclerotis with ease. It will depress a firm cataract readily, and break down the texture of one that is soft. If the operator finds it of use to bring the point of the needle into the anterior chamber of the eye (which is often the case), he may do this with the greatest safety, for the edges of the needle will not wound the iris. In short, if the operator, in the use of this needle, does but attend properly to the motion of its point, he will do no avoidable injury to the eye, and this caution becomes the less embarrassing, as the point does not project beyond that part of the needle by which the depression is made, the extreme part of the needle being used for this purpose." (*Hey.*)

Scarpa employs a very slender needle, possessing sufficient firmness to enter the eye without hazard of breaking, and having a point, which is slightly curved. The curved extremity of the needle is flat upon its dorsum, or convexity, sharp at its edges, and has a concavity, constructed with two oblique surfaces, forming in the middle a gentle eminence, that is continued along to the very point of the instrument; there is a mark on the side of the handle, which corresponds to the convexity of the point. The surgeons of the Leeds Infirmary have had one advantage in the needle, which they have used in imitation of Baron Hilmer; I mean, having it made of no greater length than the purposes of the operation demand. A couching needle is sufficiently long when it does not exceed, at most, an inch in length: this affords the operator a greater command over the motions of the point, and enables him to judge more accurately, how far it has penetrated the globe of the eye, before he has an opportunity of seeing it through the pupil. To the needle, therefore, so much recommended by Scarpa, and so successfully used by him, and Doctor Morigi, principal surgeon of the hospital at Piacenza, and one of the most expert operators of the present day in Italy, it seems proper to unite the improvement of having it made no longer than is necessary. The needle here described, will penetrate the sclerotic coat as readily as any straight one, of the same diameter, and, by reason of its slenderness, will impair the internal structure of the eye less in its movements than common couching needles. When cautiously pushed in a transverse direction, till its point has reached the upper part of the opaque lens, it becomes situated with its convexity towards the iris, and its point in an opposite direction; and, upon the least pressure being made by its convex surface, it removes the cataract a little downward, by which a space is afforded at the upper part of the pupil, between the cataract and ciliary processes, through which the instrument may be safely conveyed in front of the opaque body and its capsule, which it is prudent to lacerate in the operation. In cases of caseous, milky, and membranous cataracts, the soft pulp of the crystalline may be most readily divided, and broken piecemeal by the edges of its curved extremity; and the front layer of the capsule lacerated into numerous membranous flakes, which, by turning the point of the instrument towards the pupil, may be as easily pushed through this aperture into the anterior chamber, where Scarpa finds absorption takes place more quickly, than behind the pupil.

In ordinary cases, there is not the least occasion for any preparatory treatment previous to the operation; all that prudence requires is, that the patient should abstain from animal food, and fermented liquors, for a few days before submitting to it, and should take one dose of a gentle purgative. But this, like every other general observation, is liable to particular exceptions. Hypochondriacal men, hysterical women, and patients subject to affections of the stomach and nervous system, should take, for two or three weeks before the operation, tonic bitter medicines, particularly the infusion of quassia, either with, or without a few drops of the æther vitriolicum to each dose; or, in other cases, ʒj of Peruvian bark, with ℈j of valerian, may be administered two or three times a day with particular benefit. It is observed by the most accurate writers upon this subject, that in such persons the symptoms consequent to operations upon the eyes, are often much more violent than in common cases; and it therefore seems proper to endeavour, previously, to meliorate their constitutions. When the patient is timid, it is very advisable to give him, half an hour before the time of operating, about fifteen drops of the *tinctura opii*, with a little wine.

Some patients, besides being afflicted with cataracts, have the edges of the eyelids swollen and gummy, with relaxation, and chronic redness of the conjunctiva. In this case, before undertaking to couch, it is advisable to apply a blister to the nape of the neck, and to keep it open for two or three weeks, by means of the Savin cerate, and to insinuate every morning and evening, between the palpebræ and globe of the eye, a small quantity of the unguentum hydrarg. nitrat. mitius, prepared according to the pharmacopocia of St. Bartholomew's Hospital, increasing its strength gradually. (℞. Unguenti hydrargyri nitrati, ℥iv. Adipis Suillæ ℥viij. Olei Olivæ, ℥ij.) In obstinate cases, when this ointment does not produce the desired effect, an ointment recommended by Janin, (Memoires sur l'Oeil,) should be substituted: it consists of ℥ss of hogslard, ℥ij of prepared tutty, ʒij of armenian bole, and ʒj of the white calx of quicksilver. At first, care should be taken to use it lowered, with twice or thrice its quantity of lard. In the daytime, a collyrium, composed of ℥iv of rosewater, ℥ss of the mucilage of quince seeds, and gr. v of the sulphate of zinc, may also be frequently used with considerable advantage. By such means the morbid secretion from the Meibomian glands, and membranous lining of the eye-lids, will be checked, and the due action of the vessels, and natural flexibility of the eye-lids, will be restored. (*Saggio di Osservazioni, &c. sulle principali malattie degli occhi. Venez.* 1802.)

### FIRM CATARACT.

In the operation, the patient should be seated rather low, opposite a window where the light is not vivid, and in such a manner that the rays may fall laterally upon the eye about to be couched. The other eye, whether in a healthy or diseased state, ought always to be closed, and covered with a handkerchief, or any thing convenient for the purpose; for, so strong is the sympathy between the two organs, that the motions of the one constantly produce a disturbance of the other. The surgeon should sit upon a seat rather higher than that upon which the patient is placed; and, to give his hand a greater degree of steadiness in the various manœuvres of couching, he will find it useful to place his elbow upon his knee, which must be sufficiently raised for this purpose, by a stool placed under the foot. The chair, on which the patient sits, ought to have a high back, against which his head may be so firmly supported, that he cannot draw it backward during the operation. The back of the chair must not slope backward, as that of a common one, but be quite perpendicular, in order that the patient's head may not be too distant from the surgeon's breast. (*Richter's Anfangsgrunde der Wundarzneykunst, P.* 207. 3 *Band.*)

The propriety of supporting the patient's head rather upon the back of the chair, on which he sits, than upon an assistant's breast, must immediately strike every impartial mind; for, as Bischoff has observed, the least motion of the assistant, even that necessarily occasioned by respiration, causes, also, a synchronous motion of the part, supported on his breast, which cannot fail to be disadvantageous, both in the operation of extraction, and of couching. Hence Callisen and Richter have recommended the same method of supporting the patient's head, as I have here submitted to public consideration.

In certain cases, where the muscles of the eye, and eye-lids, are incessantly affected with spasm; or, where the eye is peculiarly diminutive, and sunk, as it were, in the orbit, the elevator for the upper eyelid, invented by Pellier, and approved by Scarpa, may possibly prove serviceable; in operating upon young subjects, I think it might contribute much to facilitate the operation.

The couching needle (if the curved one) is to be held with the convexity of its curvature forward; its point backward; and its handle parallel to the patient's temple. The surgeon having directed the patient to turn the eye towards the nose, is to introduce the instrument boldly through the sclerotic coat, at the distance of not less than two lines from the margin of the cornea, for fear of injuring the ciliary processes. Most authors advise the puncture to be made at about one line, and some even at the minute distance of 1-16th of an inch (*Hey*) from the union of the cornea with the sclerotica; but, as the ciliary processes ought invariably to be avoided, and there is no real cause to dread wounding the aponeurosis of the abductor muscle, as some have conceived, the propriety of puncturing the globe of the eye, at the distance of two lines, or two and a half, from the margin of the cornea, as advised by Petit, Platner, Bertrandi, &c. must, in all cases, be sufficiently manifest.

Nor is it a matter of indifference, at what height the needle is introduced, if it be desirable to avoid, as much as possible, effusion of blood in the operation. Anatomy reveals to us, that the long ciliary artery pursues its course to the iris, along the middle of the external convexity of the eyeball, between the sclerotic and choroid coats; and hence, in order to avoid this vessel, it is prudent to introduce the instrument about one line below the transverse diameter of the pupil, as Dudell, Guntz, Bertrandi, Scarpa, &c. have directed. If the couching needle were introduced higher than the track of the long ciliary artery, it would be inconvenient for the depression of the cataract.

The exact place, where the point of the needle should next be guided, is, no doubt, between the cataract and ciliary processes, in front of the opaque lens, and its capsule: but, as I conceive, the attempt to hit this delicate invisible mark, borders upon impossibility, and, with a straight pointed needle, might even endanger the iris, I cannot refrain from expressing my dissent to the common method of passing a couching needle at once in front of the cataract. On the contrary, it seems safer to direct the extremity of the instrument immediately over the opaque lens, and, in the first instance, to depress it a little downward, by means of the convex flat surface of the end of the needle, in order to make room for the safe conveyance of the instrument, between the cataract, and corpus ciliare, in front of the diseased crystalline and its capsule; taking care, in this latter step of the operation, to keep the marked side of the handle forward, by which means the point of the needle will be in an opposite direction to the iris, and will come into contact with the diseased body, and the membrane binding it down in the fossula of the vitreous humour. Having done this (supposing it to be a firm cataract), the instrument will be visible through the pupil; and now we are to push its point transversely, as near as possible the margin of the lens, on the side next the internal angle of the eye, taking strict care to keep it continually turned backward. The operator is then to incline the handle of the instrument towards himself, by which its point will be directed through the capsule, into the substance of the opaque lens; and, on making a movement of the needle, describing the segment of a circle, at the same instant inclining it downward and backward, he will lacerate the former, and convey it, in the generality of cases, with the latter, deeply into the vitreous humour.

It happened, unfortunately for the credit of the operation of depression, that M. Petit admonished surgeons to beware of wounding the anterior layer of the crystalline capsule: he had an idea, that, in observing this caution, the vitreous humour would afterwards fill up the space, previously occupied by the lens, and that thus the refracting powers of the eye might become as strong as in the natural state, and the necessity for using spectacles might thereby be considerably obviated.

But, we are now apprized, that leaving this very membrane, from which M. Petit anticipated such great utility, even were it practicable to leave it constantly uninjured in its natural situation, would be one of the worst inculcations that could possibly be estabished; for, in many cases, where extraction proves fruitless, in some, where depression fails, the want of success is owing to a subsequent opacity of the crystalline capsule; in short, blindness is reproduced by the secondary membranous cataract. It seems more than probable, that in some of the instances, where the opaque lens has been said to have risen again, nothing more has happened, than the disease in question. Therefore, notwithstanding the whole capsule may be, in the majority of cases, depressed with the lens out of the axis of vision, as it is not a constant occurrence, I cannot too strongly enforce the propriety of extirpating, as it were, every source and seat of the cataract in the same operation, and, in imitation of the celebrated Scarpa, who is entitled to the honor of having first pointed out the great importance of this practice, I shall presume to recommend, as a general rule in couching, always to lacerate the front layer of the capsule, whether in an opaque or transparent state.

The capsule of the crystalline lens may retain its usual transparency, while the lens itself is in an opaque state. In this case, an inexperienced operator might, from the blackness of the pupil, suppose, not only that he had removed the lens, but also the capsule from the axis of sight; and, having depressed the cataract, he might unintentionally leave this membrane entire in its natural situation. Therefore, if there should be any reason for suspecting, that the anterior layer of the capsule has escaped laceration; if, in other words, the resistance made to moving the convexity of the instrument forward, towards the pupil, should give rise to such a suspicion; for the sake of removing all doubt, it is proper to communicate to the needle a gentle rotatory motion, by which its point will be turned forward, and disengaged, through the transparent capsule, opposite the pupil: then, by repeating a few movements downward and backward, it will be so freely rent with the needle, as to occasion no future trouble.

### FLUID, OR MILKY CATARACT.

When the case is of this description, the operator frequently finds, that, on passing the point of the couching needle through the anterior layer of the capsule, its white milky contents instantly flow out, and, spreading like a cloud over the two chambers of the aqueous humour, completely conceal the pupil, the iris, and the instrument, from his view; who, however, ought never to be discouraged at this event. In the *Critical Reflections on the Cataract*, I have dissented from continuing the operation, when, in its commencement, blood is effused into the aqueous humour; I have there adverted to the effusion of the milky matter of cataracts, into the same situation; and, I have said, that the two cases are not to be considered in a different light; but, I only alluded to the consequences of these occurrences. I shall now take the opportunity to observe, that, although it seems to me most prudent, to postpone the completion of the operation, in the example of blood concealing the pupil, in the first step of couching, and not to renew it, before the aqueous humour has recovered its transparency; yet, I am inclined to adopt this sentiment, chiefly because the species of cataract is, in this circumstance, quite unknown to the operator, consequently he must be absolutely incapable of employing that method of couching, which the peculiarities of the case may demand. It is very different when a milky fluid blends itself with the aqueous humour, and prevents the surgeon from seeing the iris and pupil: this event is itself a source of information to him, inasmuch as it gives him a perfect insight into the nature of the cataract, which he is treating; and instructs him what method of operating it is his duty to adopt. The surgeon, guided by his anatomical knowledge of the eye, should make the curved point of the needle describe the segment of a circle, from the inner, toward the outer canthus, and in a direction backward, as if he had to depress a firm cataract. (*Scarpa*). Thus he will succeed in lacerating, as much as is necessary, the anterior layer of the capsule, upon which, in a great measure, the perfect success of the operation depends; and, not only in the milky, but almost every other species of cataract.

In regard to the extravasation of the milky fluid, into the two chambers of the aqueous humour, numerous observations, from the most creditable authorities, prove, that it spontaneously disappears, very soon after the operation, and leaves the pupil of its accustomed transparency. "In twelve cases of a dissolved lens, on which I have operated," says Latta, "the dissolution was so complete, that, on entering the needle into the capsule of the lens, the whole was mixed with the aqueous humour, and all that could be done, was to destroy the capsule as completely as possible, that all the milky matter might be evacuated. In ten of these cases, vision was almost completely restored in four weeks from the operation. Mr. Pott, in treating of this circumstance, viz. the effusion of the fluid contents of the capsule into the aqueous humour, observes, that so far from being an unlucky one, and preventive of success, it proves on the contrary, productive of all the benefit which can be derived from the most successful depression or extraction, as he has often and often seen. But as this point is, I believe, no longer made an objection to couching, it would be superfluous to enlarge, in confirmation of what has been stated concerning it.

### SOFT, OR CASEOUS CATARACT.

When the cataract is of a soft, or caseous description, the particles of which it is composed, will frequently elude all efforts made with the needle to depress them, and will continue behind the pupil in the axis of vision. This has been adduced as one instance that baffles the efficacy of couching, and may really seem, to the inexperienced, an unfortunate circumstance. It often happens that, in the operation of extraction, fragments of opaque matter are unavoidably overlooked and left behind; yet Richter, who once so strenuously signalised himself in favour of the new operation, confesses, that such matter is removed by the absorbents. Supposing a caseous cataract should not have been sufficiently broken, and disturbed in the first operation, and that, consequently, the absorbents do not completely remove it, such a state may possibly require a reapplication of the instrument; but this does not generally occur, and is the worst that can happen. It is quite impossible to determine *a priori*, what effect will result from the most trivial disturbance of a cataract; its entire absorption may, in some instances, follow, while in others, a repetition of the operation becomes necessary for the restoration of sight. Even where the whole firm lens has re-ascended behind the pupil, as Latta and Hay confirm, the absorbents have superseded the necessity for couching again. The disappearance of the opaque particles of cataracts was, in all times, and in all ages, a fact of such conspicuity, that, as appears from the authorities already quoted, it was recorded, even previous to the discovery of the system of lymphatic vessels in the body. Indeed the modern observations of Scarpa and others, so strongly corroborate the account which I have given, of the vigorous action of the absorbents, in the two chambers of the aqueous humour; and, particularly, in the anterior one, that, from the moment the case is discovered to be a soft, or caseous cataract, it seems quite unnecessary to make any further attempt to depress it into the vitreous humour. Mr. Pott sometimes, in this circumstance, made no attempt of this kind, but contented himself with a free laceration of the capsule, and, after turning the needle round and round, between his finger and thumb, within the body of the crystalline, left all the parts in their natural situation, where he hardly ever knew them fail of dissolving so entirely, as not to leave the smallest vestige of a cataract. This eminent surgeon even practised occasionally what Scarpa so strongly inculcates at this day; he even pushed the firm part of such cataracts through the pupil into the anterior chamber, where it always disappeared, without producing the least inconvenience: we must, at the same time add, that he thought this method wrong, not on account of its inefficacy, but an apprehension that it would be apt to produce an irregularity of the pupil, one of the worst inconveniences attending the operation of extraction. But the deformity of the pupil, after extraction, seems to proceed either from an actual laceration of the iris, or a forcible distention of the pupil, by the passage of large cataracts through it, a kind of cause that would not be present in pushing the broken portions of a caseous lens into the anterior chamber; therefore, it does not seem warrantable to reject this very efficacious plan of treatment, for which the curved pointed needle is, undoubtedly, the best calculated. It is well deserving of notice, that Mr. Hey, who has several times seen the whole opaque nucleus and very frequently small opaque portions fall into the anterior chamber, makes this remark: "Indeed, if the cataract could, in all cases, be brought into the anterior chamber of the eye, without injury to the iris, *it would be the best method of performing the operation.*" What the same author also observes in the subsequent part of his work, is strikingly corroborative of the efficacy of Scarpa's practice. The practice of the Italian professor consists in lacerating the anterior portion of the crystalline capsule, to the extent of the diameter of the pupil, in a moderately dilated state; in breaking the pappy substance of the diseased lens piecemeal; and in pushing the fragments through the pupil, into the anterior chamber, where they are gradually absorbed.

### MEMBRANOUS CATARACT.

One great advantage of couching depends upon its generally removing the capsule, at the same time with the lens, from the passage of the rays of light to the retina. Sometimes, however, this desirable event, by which the patient is extricated from the danger of a secondary membranous cataract, does not take place even in the operation of depression; and, when the lens included in its capsule is extracted from the eye, by the other method, it may always be considered as rather an uncommon circumstance. What most frequently constitutes the secondary membranous cataract, is the anterior half of the capsule, which not having been removed, or sufficiently broken, in a previous operation, continues more or less entire in its natural situation, afterwards becomes opaque, and thus impedes the free transmission of the rays of light to the seat of vision. Sometimes the secondary membranous cataract presents itself beyond the pupil, in the form of membranous flakes, apparently floating in the aqueous humour, and shutting up the pupil: at other times it appears in the form of triangular membranes, with their bases affixed to the *Membrana Hyaloidea*, and their points directed towards the centre of the pupil. When there is only a minute membranous flake suspended in the posterior chamber, it is on no account necessary for the patient to submit to another operation; vision is tolerably perfect, and the small particle of opaque matter will, in time, spontaneously disappear. But when the secondary membranous cataract consists of a collection of opaque fragments of the capsule, accumulated so as either in a great degree or entirely to close the pupil; or when the disease consists of the whole anterior half of the opaque capsule, neglected in a prior operation, and continuing adherent in its natural situation, it is indispensable to repeat an operation; for, although in the first case, there may be good reason to hope that the collection of membranous fragments might, in time, disappear, yet it would be unjustifiable to detain the patient for weeks and months in a state of anxiety and blindness, when a safe and simple operation would restore him, in a very short space of time, to the enjoyment of this most useful of the senses. In the second case, it is absolutely indispensable: for while the capsule remains adherent to its natural connexions, the opacity seldom disappears, and may even expand itself over a larger portion of the pupil. The operation should be performed as follows: when the aperture in the iris is obstructed by a collection of membranous flakes, detached from the membrana hyaloidea, the curved needle should be introduced, with the usual precaution of keeping its convexity forward, its point backward, until arrived behind the mass of opaque matter; the surgeon is then to turn the point of the needle towards the pupil, and is to push through this opening, regularly one after another, all the opaque particles into the anterior chamber, where, as we have before noticed, absorption seems to be carried on more vigorously than behind the pupil. All endeavours to depress them into the vitreous humour, Scarpa has found to be vain; for scarcely is the couching needle withdrawn when they all re-appear at the pupil, as if, (to use his own phrase) carried thither by a current: but when forced into the anterior chamber, besides being incapable of blocking up the pupil, they lie, without inconvenience, at the bottom of that cavity, and in a few weeks are entirely absorbed.

When the secondary membranous cataract consists of the whole anterior layer of the crystalline capsule, or of several portions of it connected with the membrana hyaloidea, the surgeon, after cautiously turning the point of the needle towards the pupil, is to pierce the opaque capsule; or, should there be any interspace, he is to pass the point of the instrument through it; then, having turned it again backward, he is to convey it, as near as possible, to the attachment of the membranous cataract, and after piercing the capsule, or each portion of it successively, and sometimes carefully rolling the handle of the instrument between his finger and thumb, so as to twist the capsule round its extremity, he will thus break the cataract, as far as it is practicable, at every point of its circumference. The portions of membrane, by this means separated from their adhesions, are next to be cautiously pushed, with the point of the couching needle turned forward, through the pupil, into the anterior chamber. In these manœuvres the operator must use the utmost caution not to injure the iris, and ciliary processes, for, upon this circumstance depends having no bad symptoms after the operation, notwithstanding its duration may have been long, and the necessary movements of the needle numerously reiterated. If a part of the membranous cataract should be found adherent to the iris, (a complication, that will be indicated when, upon moving it backward or downward with the needle, the pupil alters its shape, and, from being circular becomes of an oval, or irregular figure), even more caution is required than in the foregoing case, so as to make repeated, but delicate movements of the needle, to separate the membranous opacity, without injuring the iris.

Nor will it be necessary to vary the plan of operating already explained, if occasionally the cataract should be formed of the posterior layer of the capsule.

The same plan also succeeds in those rare instances where the substance itself of the crystalline wastes, and is almost completely absorbed, leaving the capsule opaque, and including, at most, only a small nucleus, not larger than a pin's head. Scarpa terms it the *Primary Membranous Cataract*; he describes it as being met with in children, or young people under the age of twenty; as being characterized by a certain transparency, and similitude to a cobweb; by a whitish opaque point, either at its centre or circumference; and, by a streaked and reticulated appearance: he adds, that whosoever attempts to depress such a cataract is baffled, as it re-appears behind the pupil soon after the operation; he recommends breaking it freely with the curved extremity of the couching needle, and pushing its fragments into the anterior chamber, where they are gradually absorbed in the course of about three weeks.

No other topical application is generally requisite, after the operation, than a small compress of fine linen; the patient ought to be kept in a quiet, dark room, and in bed. A dose of some mild purgative salt, such as the natron vitriolatum; magnesia vitriolata; soda phosphorata, &c. may usually be administered, with advantage, on the following morning. I shall not enlarge upon the method of treatment, when the inflammation, subsequent to couching, exceeds the ordinary bounds; in hypochondriacal, hysterical, and irritable constitutions, this is more frequently met with, and I have already touched upon the propriety of some preparatory measures, before couching these unfavourable subjects.

I cannot help remarking how judicious it is never to attempt too much at one time of couching. It happens in this, as in most other branches of operative surgery, that celerity is too often mistaken for skill: the operator should not only be slow and deliberate in achieving his purpose; he should be taught to consider, that a repetition of couching may, like the puncture of a vein, be safely and advantageously put into practice again and again; and with far greater security than if, for the sake of appearing expeditious, or avoiding the temporary semblance of failure, a bolder use of the couching needle should be made, than the delicate structure of the eye warrants. We read, in Mr. Hey's *Practical Observations on Surgery*, that he couched one eye seven times, before perfect success was obtained; had he been less heedful, and endeavoured to effect by one or two rough applications of the instrument, what he achieved by seven efforts of a gentler description, it is highly probable that the structure of the eye would have been so impaired, as well as the consequent ophthalmy so violent, as to have utterly prevented the restoration of sight.

### OF THE CONGENITAL CATARACT, AND OPERATING UPON CHILDREN.

So much has been already said in a preceding section of this article, concerning the propriety and striking advantages of operating for the cataracts of children, that, to expatiate further upon this point, would be a mere waste of time.

We have noticed the case, which Scarpa terms the *primary membranous cataract*, and which is mentioned by that distinguished professor, as being met with in children, or young people, under the age of twenty, the substance of the crystalline itself being almost entirely absorbed, while the capsule is left in an opaque state, including, at most, only a small nucleus, not larger than a pin's head. This disease is described by Scarpa as being exceedingly rare, and characterised by a certain transparency, and similitude to a cobweb; by a whitish opaque point, either at its centre, or circumference; and by a streaked and reticulated appearance. Now, this example, which is represented by Scarpa, as being rare, appears, from the experience of Mr. Saunders, to be by no means uncommon, since, at the London Infirmary for curing diseases of the eye, it has been found that the majority of congenital cataracts were capsular, or membranous. This last statement is also at variance with that of the late Mr. Gibson, who has asserted, that, in infants, the cataract is generally fluid. (*Edinb. Med. and Surgical Journal, Vol.* 7, *p.* 397.) Mr. Ware also asserts, that, in children, born with cataracts, the crystalline humour has generally, if not always, been found either in a soft, or fluid state. (*Observ. on the Cataract and Gutta Serena, Vol.* 2, *p.* 380.) However, as Mr. Saunders must have had the most experience in these particular cases, I believe, we must consider his account as the most accurate. We learn from this last gentleman's publication, that, in the congenital cataract, after the crystalline lens is converted into an opaque substance, it is gradually absorbed; and, in proportion to the progress of absorption, the anterior lamella of the capsule approaches the posterior, until they form one membrane, which is white, opaque, and very elastic. This process is commonly completed long before the eighth year, and the operator will now find a substance, which he will in vain endeavour either to extract or depress. But, there is one form of the congenital cataract, in which the absorption of the lens does not proceed, viz. when the centre of the crystalline is opaque, and its circumference is perfectly transparent. Should the capsule and lens be penetrated, however, with any instrument, the opacity soon becomes complete, and from this moment, the substance of the lens begins to be absorbed.

The experience of Mr. Saunders proves, that, in the congenital cataract, the lens may be either solid, soft, or fluid, but, that more frequently it is partially, or completely absorbed, and the cataract is capsular.

The following table of forty-four cases is given in Mr. Saunders's work, for the purpose of shewing in what proportion, each species of cataract has been found to prevail in congenital cases.

| | |
|---|---|
| Solid opaque lens, with or without opacity of the capsule. Three single, two double cataracts | 5 |
| Solid lens, opaque in the centre, transparent in the circumference, with capsule in the same state. Five double | 5 |
| Soft opaque lens, with, or without opacity of the capsule. Two single, two double | 4 |
| Soft opaque lens, with solid nucleus. One single, two double | 3 |
| Soft opaque lens, with dotted capsule, the spots white, the spaces transparent. Two double | 2 |
| Fluid cataract, with opacity of the capsule. Two single | 2 |
| Fluid cataract, with opacity of the capsule, and closed pupil. Two double | 2 |
| Opaque and thickened capsule, the lens being completely absorbed, or the remains of it being thin and squamose. Six single, twelve double | 18 |
| Opaque and thickened capsule, with only a very small nucleus of the lens unabsorbed in the centre. Two single | 2 |
| Opaque and thickened capsule in the centre, remains of the lens in the circumference. One double | 1 |

Here the corresponding character of congenital cataracts in the eyes of each individual is exhibited by the number of double cases, and, we are informed, that the same character was preserved in the cataracts of several children of the same family. (*Saunders on Diseases of the Eye, Edit. by Dr. Farre, p.* 135, 136.)

The congenital cataract appears frequently to afflict several children of the same parents. In the course of the present article, I have already had occasion to advert to two striking examples of this fact. The first is related by Mr. Lucas, who attended five children of a clergyman at Leaven, near Beverley, all born with cataracts. (See *Med. Obs. and Inquiries, Vol.* 6.) The second is mentioned by Mr. Gibson, who, some years ago, saw five, or six children, the families of two sisters, who were all totally blind, and in an idiotic state, having cataracts accompanied with amaurosis. (*Edinb. Med. and Surgical Journal, Vol.* 8, *p.* 398.) Several instances occurred to the late Mr. Saunders. In one family, two brothers were thus afflicted. In a second family, two brothers, twins, became blind with cataracts at the age of twenty-one months, each within a few days of the other. It is remarkable, that the four cataracts had precisely the same character. In a third family, a brother and two sisters were born with this disease. The eldest sister was affected with it only in one eye, the brother and youngest sister in both eyes. In a fourth family, three brothers and a sister had all congenital cataracts. (*Saunders on the Diseases of the Eye, p.* 134, 135.)

Children with congenital cataracts possess various degrees of vision; but, when they are totally blind, their eyes not being attracted by external objects, volition is not exercised over the muscles of these organs, which roll about with an irregular, rapid, and trembling motion.

I shall now proceed to speak of the manner of operating upon children. Until the time of Mr. Pott, the intention of surgeons, in couching, or depressing the cataract, (as indeed the expression itself implies) was to push the opaque crystalline downward, away from the pupil. Mr. Pott, conscious that the cataract often existed in a fluid, or soft state, was aware that it could not then be depressed; and, therefore, in such cases, he recommended using the couching needle for the express purpose of breaking down the cataract, and of making a large aperture in the capsule, so that the aqueous humour, which he believed to be a solvent for the opaque crystalline, might come into immediate contact with this body. This operation, since the time of Mr. Pott, has been strongly and ably recommended by Mr. Hey, of

Leeds, and Professor Scarpa, of Pavia. In the cases of children, it even received the approbation of the late Mr. Ware, who informs us that he and his son had performed a similar operation on a considerable number of infants and young persons with uniform success. (*On the Operation of Puncturing the Capsule of the Crystalline Humour, p.* 9.)

But, notwithstanding the utility and efficacy of lacerating the front layer of the crystalline capsule had been so much insisted upon by Scarpa and others, their observations were confined to the cataract in the adult subject, and, before the example set by the late Mr. Saunders, no one, (excepting, perhaps, Mr. Gibson of Manchester) ventured to apply, as a regular and successful practice, such an operation to the eyes of infants and children. Indeed, it seems highly probable, that even Mr. Gibson himself would have remained silent upon the subject, had not his attention been roused by the reports of the London Institution for curing diseases of the eye, which reports, he says, were dispersed and exhibited in the public newsrooms of Manchester. For the creation and perfection of this beneficial practice, therefore, I am disposed to give the memory of Mr. Saunders great honour. The propriety of operating for the cataracts of children had long ago been insisted upon by a few writers, and the attempt even now and then made; but, the method never gained any ground, until Mr. Saunders led the way.

It only remains for me to describe the plans of operating, as executed by Mr. Saunders, Mr. Gibson, and Mr. Ware.

The principle, on which Mr. Saunders proceeded in his operations on the congenital cataract, is founded on the opinion, that the only obstacle to the absorption of the opaque lens is the capsule; and that as the latter also is most generally opaque, "the business of art is to effect a permanent aperture in the centre of this membrane. This applies to every case of congenital cataract, which can occur." Mr. Saunders used to overcome the difficulty of operating upon children, by fixing the eye ball with Pellier's elevator, having the patient held by four or five assistants, dilating the pupil with the belladonna, and employing a very slender needle, armed with a cutting edge from its shoulders to its point, and furnished with a very sharp point, calculated to penetrate with the utmost facility.

Before the operation, the extract of belladonna, diluted with water to the consistence of cream, is to be dropped into the eye, or, to avoid irritation, the extract itself may be smeared in considerable quantity, over the eyelid and brow. In less than an hour, if there be no adhesions, it produces a full dilatation of the pupil, exposing to view nearly the whole anterior surface of the cataract. The application should then be washed from the appendages of the eye.

In using the needle, Mr. Saunders most carefully abstained from doing any injury to the vitreous humour, or its capsule, and it was an essential point with him to avoid displacing the lens. In directing the extremity of the instrument to the centre of the capsule, he passed it either through the cornea, near the edge of this membrane, or through the sclerotica, a little way behind the iris. By the first, which is called the *anterior* operation, Mr. Saunders conceived, that less injury would be inflicted, and less irritation excited, than by introducing the needle behind the iris, through all the tunics of the eye. In every case, the first thing aimed at was the permanent destruction of the central portion of the capsule to an extent equal to that of the natural size of the pupil. If the capsule contained an opaque lens, Mr. Saunders used next to sink the needle gently into the body of the crystalline, and moderately open its texture; cautiously observing not to move the lens at all out of its natural situation.

When the case was a fluid cataract, Mr. Saunders was content in the first operation with simply lacerating the centre of the capsule, being desirous of avoiding to increase the irritation following the diffusion of the matter of the cataract in the aqueous humour.

When the cataract was entirely capsular, Mr. Saunders acted with rather more freedom, as he entertained in this case less fear of inflammation; but, in other respects, he proceeded with the same objects in view, which have been already related, and of which the principal consisted in effecting a permanent aperture in the centre of the capsule, without detaching this membrane at its circumference; for then the pupil would have been more or less covered by it, and the operation imperfect, "because this thickened capsule is never absorbed, and the pendulous flap is incapable of presenting a sufficient resistance to the needle to admit of being removed by a second operation." (*P.* 145.)

I have already explained, that Mr. Saunders found, that the greatest success attended the operation between the ages of eighteen months and four years. One operation frequently accomplished a cure; as many as five were seldom requisite.

The only particularity, in Mr. Saunders's treatment of the eye after the operation, was that of applying the belladonna externally, for the purpose of making the pupil remain dilated, till the inflammation had ceased, so as to keep the edge of the iris from contracting adhesions with the margin of the torn capsule. In leaving this part of the subject, I must advise every surgeon to read the interesting account of Mr. Saunders's practice, published by his friend and colleague, Dr. Farre. Many minute particulars will be found in this work, highly worthy of the practitioner's attention and imitation.

Mr. Gibson appears to have been unacquainted with the usefulness of the extract of belladonna in preparing the eye for the operation. A few hours before operating, he was in the habit of ordering an opiate, sufficient to produce a considerable degree of drowsiness, so that the infant generally allowed its eyelids to be opened, and properly secured without resistance, and was little inclined to offer any impediment to the introduction of the couching needle; but, on the contrary, presented the sclerotica to view, naturally turning up the white of its eye. If the infant was more than a year old, and whenever it was necessary, Mr. Gibson used to introduce its body and arms into a kind of sack, open at both ends, and furnished with strings to draw round the neck, and tie sufficiently tight round the legs, so that its hands are effectually secured, and the assistants have only to steady its body, and fix its head, whilst the child is laid on a table, upon a pillow. Mr. Gibson never found it necessary to use a speculum, having uniformly experienced, that, after the couching needle was introduced, he had no difficulty in commanding the eye, aided by a slight degree of pressure upon the eyeball with the index and middle fingers of his left hand, which were employed in depressing the lower eyelid. He admits, however, that the speculum can easily be applied, if an operator prefer it. He generally used Scarpa's needle, because, in infants, the free rupture of the capsule of the lens ought commonly to be aimed at, in order that the milky cataract may escape, and mix with the aqueous humour; or, if the cataract be soft, that the aqueous humour may be freely admitted to its pulpy substance, which has been previously broken down with the needle. He thinks, that no peculiarity is necessary in depressing the hard cataract of infants. Before Scarpa's needle was known in this country, Mr. Gibson used Mr. Hey's, which was generally effectual, and, as he conceives, possesses the recommendation of being less liable to have its point entangled in the iris. He says, that, when a milky cataract has been thus evacuated, it renders the aqueous humour turbid; but, that, within the space of two days, the eye generally acquires its natural transparency, and vision commences. When the capsule and substance of the soft cataract have been broken down, and the aqueous humour has come into contact with the lens, the solution and disappearance of the cataract, in all the cases, upon which Mr. Gibson has operated, have uniformly taken place, in a short time. The experience of Mr. Gibson curiously differs from that of Mr. Saunders in one respect: he assures us, that although he has met with cataracts in infants hard enough to bear depression, yet, that *he has never met with a simple membranous cataract;* though this is no uncommon occurrence in patients at the age of eight, or ten, as well as in adults, who have been blind from birth. (See *Edinburgh Med. and Surgical Journal, Vol.* 8, *p.* 398, 399.)

For the purpose of fixing the eye, Mr. Ware thinks Pellier's elevator requisite in operating upon infants. When the patient, however, has advanced beyond the age of infancy, Mr. Ware sometimes fixes the eye by means of the fingers alone. For the purpose of puncturing the capsule, and breaking down the cataract, this gentleman gives the preference to an instrument, which resembles one, that was recommended by Cheselden for the purpose of making an artificial pupil; but, it is somewhat narrower. Its blade indeed is so narrow, that it nearly resembles a needle. Its extremity is pointed, and it cuts on one side for the space of about the eighth of an inch, the other side being blunt. It is perfectly straight; is an inch long in the blade; and forms a complete wedge through its whole length. Upon one side of the handle is a coloured spot, by attending to which, the operator may always ascertain the position of the instrument in the eye.

Mr. Ware dilates the pupil with the extractum belladonnæ, softened with a little water, and applied about half an hour before the time of operating. This gentleman thinks, that, in operating upon infants, the surgeon will perform the operation with more composure, if the patient be laid upon a table, with the head properly raised on a pillow. The bent end of Pellier's elevator should be introduced under the upper eyelid, and the instrument committed to the care of an assistant. If the right eye is to undergo the operation, and the surgeon operate with his right hand, he must of course sit or stand behind the patient; and, in this case, he will himself manage the speculum with his left hand. The eye being thus fixed, Mr. Ware passes the point of the narrow bladed knife above mentioned through the sclerotica, on the side next to the temple, about the eighth of an inch from the union of that membrane to the cornea, the blunt edge being turned downwards. The instrument is pushed forwards in the same direction, until its point nearly reaches the centre of the crystalline. The point should then be brought forwards, until it has passed through the opaque crystalline and its capsule, and is plainly visible in the anterior chamber of the aqueous humour. If the cataract be fluid, and the anterior chamber become immediately filled with the opaque matter, Mr. Ware thinks it advisable to withdraw the instrument, and defer further measures until the matter is absorbed, which absorption usually takes place in the course of a few days, and sometimes of a few hours. If no visible change be produced in the pupil, the point and cutting edge of the instrument should be applied in different directions, so as to divide both the opaque crystalline and its capsule into small portions, and, if possible, to bring them forwards into the anterior chamber. This may require the instrument to be kept in the eye for a minute or two; but, if the operator preserve his steadiness, he may continue it there a much longer time without doing the least injury to the iris or to any other part. If the cataract be found of a firm consistence, (though this rarely happens in young persons,) it may be advisable to depress it below the pupil; and in such a case particular care should be taken to perforate largely the posterior part of the capsule, and to withdraw the instrument immediately after the cataract has been depressed, in order to hinder it from rising again. If the opacity be in the capsule, the instrument will not act so easily upon it as it does on the opaque crystalline; but, notwithstanding this, the capsule as well as the crystalline, may be divided by it into larger or smaller portions, which, when thus divided, will be softened by the action of the aqueous humour; and though in the first operation on such case, says Mr. Ware, it may not be possible to remove the opacity, yet, on the second or third attempt, the divided portions may be brought forwards into the anterior chamber of the aqueous humour, in which place, they will then be gradually absorbed, and will soon disappear. After the operation, Mr. Ware has seldom found it necessary to take away blood from children, or persons under the age of twenty. He continues a cooling antiphlogistic treatment a few days. After this, if any opaque matter remain, he expedites its absorption by dropping a small portion of powdered sugar into the eye once or twice a day. When, at the end of a week or ten days, the inflammation is over, and the pupil is obstructed with opaque matter, Mr. Ware advises a repetition of the operation. After a similar interval, the operation may be requisite again. Mr. Ware has, in most cases, been obliged to operate twice; in a few instances, once has been sufficient; and only in three, out of the last twenty, has he found it necessary to operate a fourth time. (*On the Operation of Puncturing the Capsule of the Crystalline Humour.*)

I think any impartial man, who considers the practice of the three preceding operators, will find great cause to admire the superior gentleness and skill, which predominate in the operations of the late Mr. Saunders. For my own part, I am so fully convinced of the mischief, which has been done to the eyes, by the rash boldness, awkwardness, and unsteadiness of numerous operators, that, it appears to me, the inculcation of gentleness and forbearance in all operations for the cataract, is the bounden duty of every man, who has occasion to write upon the subject. Great manual skill, and invariable gentleness, indeed, seem to me to have had more share in rendering Mr. Saunders's operations successful, than any particularity either in his method, or his instrument. I have no hesitation in declaring my own partiality to the principles, on which his practice was founded, and my belief, that they are well calculated to improve most materially this interesting branch of surgery. Consult particularly *Celsus De Re Medicâ. Pott's Remarks on the Cataract, Vol.* 3, *of his Chirurgical Works. Daviel sur une Nouvelle Méthode de Guérir la Cataracte par l'Extraction du Crystallin, in Mém. de l'Acad. de Chirurgie, Tom.* 5, *p.* 369, *Edit.* 12*mo. Wenzel's Treatise on the Cataract, by Ware. Richter's Treatise on the same subject, and his Anfangsgrunde der Wundarzneykunst, Band* 3. *Ware's Chirurgical Observations on the Eye,* 2 *Vol. Edit.* 3. *Scarpa's Observations on the Principal Diseases of the Eyes. Critical Reflections on Several Important Practical Points relative to the Cataract by the author of this Dictionary. Hey's Practical Observations in Surgery. Saunders on Diseases of the Eye, by Farre. Beer's Practische Beobachtungen über den grauen Staar, &c. Vienna,* 1791. *Lassus, Pathologie Chirurgicale, Tom.* 2, *p.* 504, *&c. Edit.* 1809. *Léveillé, Nouvelle Doctrine Chirurgicale, Tom.* 3, *p.* 308, *&c. Richerand's Nosographie Chirurgicale, Tom.* 2, *p.* 84, *Edit.* 4. *Gibson's Practical Observations on the Formation of an Artificial Pupil, and Remarks on the Extraction of Soft Cataracts, &c. Travers in Medico-Chirurgical Transactions, Vol.* 4 *and* 5. *W. Adams's Practical Observations on Ectropium, Artificial Pupil, and Cataract,* 1812.

CATHETER. (from καθιημι, to thrust into.) A tube which is introduced through the urethra into the bladder, for the purpose of drawing off the urine. (See *Urine, Retention of.*) Of course there are two kinds of catheters, one intended for the male, the other for the female urethra. The common catheter is a silver tube, of such a diameter as will allow it to be introduced with ease into the urethra, and of various figures and lengths, according as it is intended for the young or adult, the male or female, subject. A common male catheter is ten or eleven inches long. In general, a large instrument of this kind, like a large bougie, will enter the bladder with more ease than a small one, because less likely to be entangled in the lacunæ of the urethra. One-third of the male catheter, towards its point, should be moderately curved; the other two-thirds, towards its handle, should be straight. The instrument, when gently curved, is found to be more easy of introduction than when it is very much bent. The female catheter is straight, excepting a slight curvature towards its point, and it is about six inches long.

The catheter, as it need not enter far into the neck of the bladder, though it should always be as big as the urethra will easily admit, should not, says John Bell, be long, and should have a very gentle and simple curve. (*Principles of Surgery, Vol.* 2, *p.* 193.)

The common flexible catheter is only a hollow bougie, and the elastic one contains in its composition elastic gum. The two last descriptions of catheters have the advantage of being less irritating to the urethra, and less apt to become covered with calculous incrustations, than silver tubes. They can also be frequently introduced when an inflexible metallic one will not pass.

Flexible catheters are now generally made of woven silk cylinders, covered with a coat of elastic gum. The best used to be fabricated at Paris by M. Bernard. But, at the present time, the best maker is M. Feburier, orfêvre, in the Rue du Bac, No. 51, at Paris. The gum catheters are made at Paris of twelve different sizes, which correspond to twelve holes in a plate of brass. "Each catheter, therefore, (says a late intelligent visitor to that capital) has its size designated by its number, which greatly facilitates the ascertaining of the progress of the case towards a cure. Numbers 1 and 2 are smaller than can be procured in England, and are so slender, that I thought there might be danger of their breaking, until I was convinced by seeing the method of making them, that there is no reason for fearing any such thing. A firm tissue of silk is woven upon a brass stilet, of the size of the cavity of the instrument to be made. In weaving this tissue, the orifice or eye is left, and the whole therefore consists of one entire thread. The successive layers of varnish are deposited on the outer surface of the silken tissue, their number depending on the size of the instrument; and each coating of varnishing undergoes a long process of scouring before the next is put on, for which purpose women are employed by M. Feburier." (See *Sketches of the Medical Schools of Paris by J. Cross*, 1815, *p.* 122—123.)

According to this gentleman, however, the English gum catheters possess advantages: "they retain their curve better without the stilet, are less liable to crack, and have eyes more smooth and better formed." (*P.* 124.) Bernstein, in his Dictionary of Surgery, gives the following account of this instrument, as it is fabricated in Germany: "One of the most useful inventions which have been made, with respect to these instruments, is to construct them of elastic gum, and the merit of this invention is to be ascribed, without doubt, to Theden. (*Neue Bemerkungen u. Erfahrungen, &c. Th.* 2. *Berlin*, 1782, *p.* 143.) They were afterwards improved by a silversmith at Paris, of the name of Bernard, who directed not to apply the dissolved elastic gum to a wire cylinder, as Theden had done, but to one made of knitted silk; and these catheters certainly deserve to be recommended in preference to all others. But with respect to their price, the elastic catheters, that are prepared by Pickel, of Wirzburg, (*Richter's Chir. Bibliothek, B.* 6, *p.* 512), deserve particular recommendation. These consist of silk cylinders, plaited, or worked upon a probe, and afterwards covered with the following varnish: three parts of white-lead, minium, or sugar of lead, with boiled linseed oil, which is the common varnish used by cabinet-makers, mixed with one part of melted amber, and the same quantity of oil of turpentine. With this varnish he spreads the silk cylinders, and repeats this three times, as soon as the former coating has dried in the open air; after which he puts the catheters into a baker's oven 24 hours, when bread has been baked in it the last time, and when it retains the temp. of 60. 70. Reaum. Here he lets them remain 10 or 12 hours. When he has taken the catheter out of the oven, he rubs the inequalities off with a little pumice-stone, sews up the end, cuts into it the oblong lateral aperture, and then spreads it 12 or 15 times more with the varnish. Every time, however, the catheter must be well dried in the open air, before the varnish is spread upon it again, and after every third coating which it has received, it must be put into the oven again, so that it must in all have received from 15 to 18 coatings with varnish, and have been laid five or six times in the oven. The end is smoothed off with oil. Each of these catheters costs a dollar." (*Cyclopædia by Rees, Art. Catheter.*)

Sometimes it is difficult to introduce the inflexible catheter, in consequence of the urethra and neck of the bladder being affected with spasm. In this case a dose of opium should be administered, before a second attempt is made. When inflammation prevails in the passage, the introduction may often be facilitated by a previous bleeding.

The operation of introducing the catheter may be performed, either when the patient is standing up, sitting, or lying down.

In doing it, one of the most important maxims is, never to force forward the instrument, when it is stopped by any obstacle If there are no strictures, the stoppage of the catheter is always owing to one of the following circumstances. Its beak may be pushed against the os pubis. This chiefly occurs when the handle of the instrument is prematurely depressed. Here the employment of force can obviously do no good, and may be productive of serious mischief. The beak of the catheter may take a wrong direction, and push against the side of the urethra, especially at its membranous part, which it may dilate into a kind of pouch. In this circumstance, if force were exerted, it would certainly lacerate the urethra, and occasion a false passage. The end of the catheter may get entangled in a fold of the lining of the urethra, and here force would be equally wrong. Lastly, the point of the instrument may be stopped by the prostate gland, in which case force can be of no service, and may do great harm. Hence it is always proper to withdraw the instrument a little, and then push it gently onward in a different position.

The operation may be divided into three stages. In the first, the catheter passes, in the male subject, that portion of the urethra which is surrounded by the corpus spongiosum; in the second, it passes the membranous part of the canal, situated between the bulb and the prostate gland; and in the third, it enters this gland, and the neck of the bladder.

In the first stage, little trouble is usually experienced; for the canal is here so supported by the surrounding corpus spongiosum, that it cannot easily be pushed into the form of a pouch, in which the end of the instrument can be entangled. The operator need only observe the following circumstance: the penis should be held, by placing the corona glandis between the thumb and the index finger of the left hand: in this way the entrance of the urethra will not be at all compressed. The penis is then to be drawn upward: the catheter being well oiled, is now to be introduced, with the concavity towards the abdomen, into the urethra, directly downward, until its point reaches the bulb. As soon as this is accomplished, and the beak of the instrument has passed under the arch of the pubes, the surgeon must very slowly bring the handle of the catheter forwards, between the patient's thighs, and, as he is doing this, the beak of the instrument becomes elevated, and glides into the bladder. In this stage of the operation the penis must be allowed to sink down, and not be kept tense, as this would only drag the membranous part of the urethra against the os pubis, and render the passage of the instrument more difficult.

The operation, however, is not always successfully accomplished in this manner. The beak of the catheter may be stopped by the os pubis; it may take a wrong direction, so as to push the membranous part of the urethra to one side or the other; or it may be stopped by a fold of the lining of the passage.

The first kind of impediment is best avoided, by not depressing the handle of the catheter too soon; that is, before the point has passed beyond the arch of the pubes. When the membranous part of the urethra is pushed to one side or the other, the instrument ought to be withdrawn a little, and then pushed gently on in a different direction. When this expedient is unavailing, the index finger of the left hand may be introduced into the rectum, for the purpose of supporting the membranous part of the urethra, and finding the extremity of the catheter.

When the prostate gland is enlarged, the diameter of the urethra does not undergo any diminution as it passes through the diseased body; but it turns up very suddenly, just as it approaches the bladder. In such cases, the end of the catheter should be more bent upward, than the rest of its curvature.

In the third stage of the operation, the beak of the instrument has to pass the prostate gland and neck of the bladder. The principal obstacles to its passage, in this situation, arise from spasm of the neck of the bladder, and from the instrument being pushed against the prostate gland. The first impediment may generally be obviated by waiting a few moments, and gently rubbing the perineum, before pushing onward the catheter. The hindrance, caused by the prostate, is best eluded by using an instrument the point of which is more curved than its other part. Sometimes the surgeon himself presses the prostate towards the os pubis, by means of his finger in the rectum, and thus prevents the passage of the catheter, by increasing the sudden curvature at this part of the urethra. Hence, as Richter observes, it is a very important maxim, never to introduce the finger so far into the rectum, as to press on the prostate gland itself.

When the catheter has turned round the pubes, and is just about to enter the neck of the bladder, is the critical moment, in which may be seen, whether a surgeon can or cannot pass a catheter; for, if he knows how to pass it, he suddenly, but not violently, changes its direction. He depresses the handle with a particular kind of address, and raises the point, which, as if it had suddenly surmounted some obstacle, starts into the neck of the bladder, and the urine bursts out in a jet from the mouth of the catheter.

They, who are unskilful, press the tube forward, and persist, as they had begun, in drawing up the penis, on the supposition that by stretching this part they lengthen the urethra, and make it straight, whereas they elongate only that part of the canal, along which the catheter has already passed. (*John Bell's Principles of Surgery. Vol.* 2, *p.* 213.)

Mr. Ware passes the catheter in the following manner: the instrument being first thoroughly oiled, he introduces it into the urethra, with its convex part uppermost, and carries it as far as it will pass without using force. He then turns it *slowly* round, so as to bring its concave side uppermost; and in doing this he makes a large sweep with the handle of the instrument, and at the same time keeps his attention steadily fixed on its apex, which he takes particular care not to retract, nor to move from its first line of direction. When the catheter is turned, it must still be pressed onward, and its handle at the same time gently depressed. By this method, says Mr. Ware, it will be made to enter the bladder.

The catheter, made use of by Mr. Ware, is twelve inches long, which is more than an inch above the ordinary length; and the curvature is larger than common. With this instrument he has often succeeded, when with others of a different size and curvature it was not possible to succeed.

A great number of excellent modern surgeons prefer introducing the catheter as far as the perineum, as Mr. Ware does, with its convexity towards the abdomen. They then keep the point stationary while they make the handle describe a semicircular movement upward, so as to bring the concavity of the instrument towards the pubes. The catheter then becomes situated just as it is in the other method.

Mr. Hey has offered some good practical remarks on the introduction of the catheter. If, says he, the point of the catheter be less turned than the urethra, the point will be pushed against the posterior part of the passage, instead of following the course of the canal. The posterior part of the urethra has nothing contiguous to it which can support it; and no considerable degree of force will push the point of the catheter through that part between the bladder and the rectum. If this accident is avoided, still the point will be pushed against the prostate, and cannot enter the bladder. Mr. Hey tells us, that the truth of this is illustrated, by the assistance which is derived, whenever the catheter stops at the prostate, from elevating the point of the instrument with a finger introduced in the rectum.

Mr. Hey takes notice of the impropriety of pushing forwards the point of the catheter, before its handle is sufficiently depressed, as the point would move in a horizontal direction, and be likely to rupture the posterior side of the urethra.

The difficulty, arising from the inflamed and dry state of the passage, Mr. Hey says, is greatly obviated by the previous introduction of a bougie well covered with lard.

In order to pass the catheter, Mr. Hey places his patient on a bed, in a recumbent posture, his breech advancing to, or projecting a little beyond, the edge of the bed. If the patient's feet cannot rest upon the floor, Mr. Hey supports the right leg by a stool, or by the hand of an assistant. The patient's head and shoulders are elevated by pillows; but the lower part of the abdomen is left in a horizontal position. Mr. Hey commonly introduces the catheter with its convexity towards the abdomen, and having gently pushed down the point of the instrument, till it becomes stopped by the curvature of the urethra, under the symphysis pubis, he turns the handle towards the navel, pressing at the same time its point. In making the turn he sometimes keeps the handle at the same distance from the patient's abdomen, and sometimes makes it gradually recede; but, in either method, he avoids pushing forwards the point of the catheter any farther than is necessary to carry it just beyond the angle of the symphysis pubis. When he feels that the point is beyond that part, he pulls the catheter gently towards him, hooking, as it were, the point of the instrument upon the pubes. He then depresses the handle, making it describe a portion of a circle, the centre of which is the angle of the pubis. When the handle of the catheter is brought into a horizontal position, with the concave side of the instrument upwards, he pushes forwards the point, keeping it close to the interior surface of the symphysis pubis; for when passing in this direction, it will not hitch upon the prostate gland, nor injure the membranous part of the urethra.

If the surgeon uses a flexible catheter, covered with elastic gum, it is of great consequence to have the stilet made of some firm metallic substance, and of a proper thickness. Mr. Hey always makes use of brass-wire for the purpose. If the stilet is too slender, the catheter will not preserve the same curvature during the operation; and it will be difficult to make the point pass upwards behind the symphysis pubis in a proper direction. If the stilet is too thick, it is withdrawn with difficulty.

When the stilet is of a proper thickness, this instrument has one advantage over the silver catheter, which is, that its curvature may be increased while it is in the urethra, which is often of great use, when the point approaches the prostate gland.

When the proper manœuvres with an inflexible catheter do not succeed, the surgeon must change it, taking a bigger or more slender one, with a greater or less curve, according to such observations as he may have made in his first attempt. But if the catheter has been of a good form or commodious size, yet has not passed easily, he should, instead of choosing a rigid catheter of another size or form, take a flexible one for his second attempt. The flexible catheter is generally slender, and of sufficient length, and its shape may be accommodated to all occasions, and to all forms of the urethra; for, having a stiff wire, we can give that wire, either before or after it has passed into the catheter, whatever shape we please; and what is of still greater importance, we can introduce the instrument without, or with the wire, as circumstances may require; or what is more advantageous, we can introduce the wire particularly so as not quite to reach the point of the catheter, but to within two inches or a little more of this part, by which contrivance the point, if previously warmed, and wrought in the hand, has so much elasticity, that it follows the precise curve of the urethra, and yet has sufficient rigidity to surmount any slight resistance. If this too fail, and especially, if there be the slightest reason to suspect, that the resistance is not merely spasmodic, but arises from stricture near the neck of the bladder in a young man, or swelling of the prostate in an old one, we may take a small bougie, turn up the extremity of it with the finger and thumb, so as to make it incline towards the pubes, and allowing no time for the wax to be softened, pass it quickly down to the obstruction, turn it with a vertical or twisting motion, and make it enter the constricted part. On withdrawing it in about ten minutes or a quarter of an hour, the urine generally escapes, or the catheter may now be introduced. (*John Bell's Principles of Surgery, Vol. 2, p. 215.*)

Mr. Hey has found, that in withdrawing the stilet of an elastic gum catheter, the instrument becomes more curved; and he has availed himself of this information, by withdrawing the stilet, as he is introducing the catheter beyond the arch of the pubes, by which artifice the point is raised into the due direction.

Mr. Hey says, you may sometimes, though not always, succeed in introducing an elastic gum catheter, by using one which has acquired a considerable degree of curvature and firmness, by having had a curved stilet kept in it a long while. Introduce this without the stilet, with its concavity towards the abdomen, taking care not to push on the point of the instrument, after it has reached the symphysis pubis, until its handle is depressed into a horizontal position.

When it is necessary to draw off the urine frequently, and the surgeon cannot attend often enough for this purpose, a catheter must be left in the urethra, till an attendant, or the patient himself, has learnt the mode of introducing the instrument. (*Hey.*)

Mr. Hey imputes the formation of a false passage, or the rupture of the membranous part of the urethra, generally to the method of pushing forwards the catheter, before its handle has been depressed. In this manner the course of the instrument crosses that of the urethra, and the point of the catheter, pressing against the posterior side of the membranous part of the urethra, is easily forced through the coats of that canal. The want of due curvature in the catheter, and of sufficient bluntness in its point, greatly contribute to facilitate this injury. In this case the point of the instrument passes more readily into the wound, than onward along the urethra against the symphysis pubis. Without this pressure, the point is apt to recede, and not readily enter the membranous part of the urethra.

Mr. Hey surmounted a difficulty of this kind, by bending upwards the point of a silver catheter, so as to keep it more closely in contact with the anterior part of the urethra, and thereby pass over the wound made in the posterior side of the canal. In the instance alluded to, as it was necessary to leave an elastic gum catheter in the urethra, Mr. Hey procured some brass wire of a proper thickness, with which he made a stilet, and, having given it the same curvature as that of the silver catheter, he introduced it about four hours after the preceding operation, and fixed it by tying it to a bag truss.

Mr. Hey sometimes succeeded by partly withdrawing the stilet, at the moment when he wished to increase the curvature of the catheter.

In an instance in which the urethra had suffered a violent contusion, Mr. Hey drew off the urine with a silver catheter of unusual thickness, after he had failed with instruments of a smaller bore. He suspected that the urethra was ruptured, and was obliged to raise the point of the catheter by a finger introduced into the rectum, and to use bleeding, purgatives, the warm bath and opium, before it could be made to pass. The elastic gum catheter was afterwards employed. It is an unsettled point, whether it is best to leave the catheter in the urethra, until the power of expelling the urine is regained, or to draw off the urine twice a day, and withdraw the catheter after each operation. Mr. Hey thinks that no general rule can be laid down; some patients cannot bear the catheter to remain introduced; others seem to suffer no inconvenience from it. On the whole, however, Mr. Hey commonly prefers removing the catheter. In this manner, he is of opinion, that the power of expelling the urine again is soonest acquired.

In France, a conical silver catheter (*sonde conique*) is frequently employed in difficult cases by Boyer, Roux, &c. This instrument has a very slight curvature and an extremity almost pointed. By force regularly applied it is introduced into the bladder in spite of all opposition. Care is taken to keep it in the centre of the passage, and the direction of its point is judged of by the position of the lateral rings. The rule, mentioned by M. Roux, for commencing the great depression of the outer extremity of the instrument, was, when by the finger in the rectum the point could be felt to have reached the apex of the prostate. (See *Sketches of the Medical Schools of Paris by J. Cross, p.* 112.) The conical catheter is usually allowed to remain introduced three or four days in bad cases, and on being withdrawn, a small flexible gum catheter afterwards generally admits of being used.

The forcible manner, in which the French surgeons employ the conical silver catheter, must often do great and dangerous mischief. Thus, in two examples, which were witnessed and examined by M. Roux himself after the decease of the patients, a false passage had been made, no flexible gum catheter could be passed, the urine was effused in the cellular membrane, and the parts were gangrenous. (See *P.* 116 *of the above work.*) According to the observation of Mr. Cross, the French surgeons employ the conical silver catheter with too little discrimination, and "in their practice they seem to make no nice distinctions between impediments to the flow of urine from spasm, irritable and inflamed state of the canal, disease of the prostate gland, and cartilaginous stricture of long duration. If the conical catheter be admissible at all, it is in the last of these cases, particularly, when combined with fistula in perinæo; and here all surgeons, who are familiar with the treatment of diseases of the urethra, occasionally use means, which approach very closely to the *forcing* method of the French. I have heard of instances, in which John Hunter employed great force with the silver catheter, and overcame the obstruction. I have seen Mr. Pearson, (who generally treats strictures as mildly, and, I need hardly say, as successfully as any man) take a steel sound, and pass it gradually and forcibly on into the bladder, at the same time feeling his way, as it were, by keeping one finger in the rectum: the relief of the patient, and the ultimate cure of the disease, were the results of this practice." (*P.* 118.) It appears further, that the conical silver catheter has been used by Mr. A. Cooper. Without altogether condemning the occasional employment of this instrument, I perfectly coincide with Mr. Cross, that it is one, with which young men of little caution and no experience may do more harm in the first few cases they meet with, than the rest of their life will afford them opportunities of doing good.

To one acquainted with anatomy, the introduction of the female catheter is exceedingly simple. From motives of delicacy to the sex, the instrument should always be passed without any exposure. The surgeon should hold the catheter in his right hand, while he introduces the forefinger of his left hand between the nymphæ so as to feel upon the upper surface of the passage the little papilla, which surrounds, and denotes to the touch, the precise situation of the orifice of the meatus urinarius. Holding the concavity of the catheter forward, the surgeon, guided by the forefinger of his left hand, is then to introduce the instrument upward into the bladder. (See *Urine, Retention of.*) (See *Hey's Practical Observations in Surgery. John Bell's Principles, Vol. 2. Ware on the Catheter. Sketches of the Medical Schools of Paris by J. Cross, p.* 111; *&c. Richter's Anfangsgr. der Wundarzneykunst. Rees's Cyclopædia, Art. Catheter.*)

CATHETERISMUS. (from *καθετης*, the instrument.) A technical word, employed by P. Ægineta, to denote the operation of introducing the catheter.

CATLING, often spelt, in surgical books, *catlin*, is a long, narrow, double-edged, sharp-pointed, straight knife, which is chiefly used, in amputations of the leg and forearm, for dividing the interosseous ligaments and the muscles, &c. situated between the two bones. The catling is frequently made too wide and large, so that it cannot execute its office with the right degree of ease.

CATOMISMOS. Paulus Ægineta signifies by this word the method of reducing a dislocated humerus, by placing the patient's arm over a strong man's shoulder, and making the latter raise him in this position off the ground, by which means, the limb becomes reduced by the weight of the body.

CAUSTICS. (from *καιω*, to burn.) Medicines, which destroy parts by burning, or chemically decomposing them.

The potassa fusa (kali purum), the potassa cum calce (calx cum kali puro), the antimonium muriatum, the argenti nitras, the hydrargyri nitrico-oxydum, the acidum sulphuricum, and the cupri sulphas, are the caustics in most frequent use among surgeons.

**CAUTERIZATION.** (from καυτηριαζω, to cauterize.) The burning any part with a cautery.

**CAUTERY.** (from καιω, to burn.) Cauteries are of two kinds, viz. *actual* and *potential.* By the first term is implied a heated iron; by the second surgeons understand any caustic application.

The high opinion, which the ancients entertained of the efficacy of the actual cautery, may be well conceived from the following passage. "Quoscumque morbos medicamenta non sanant, ferrum sanat; quos ferrum non sanat ignis sanat; quos verò ignis non sanat, insanabiles existimare opportet." *(Hipp. Sect.* 8, *Aph.* 6.) The actual cautery has been employed for the stoppage of bleeding, where the vessels could neither be tied, nor compressed. It has been also employed for the destruction of carcinomatous tumours and ulcers; fistulæ; polypi, and a variety of fungous diseases. Whoever looks over the writings of Hippocrates will discover, that the actual cautery was a principal means of relief in several chronic affections, as dropsies, diseased joints, &c.

In modern times, the actual cautery has been more and more relinquished, in proportion as surgery has attained a higher state of improvement. On the continent, however, it still retains some advocates. In France, all the professors recommend and employ it in particular cases. The hospital gangrene, a peculiar disorder, which is much more frequently seen in foreign hospitals, is said to be little affected by any internal remedies. "Vegetable and diluted mineral acids are the local means employed with effect in mild cases. I have (says Mr. Cross) already alluded to a case of Pelletan's, when carbon was applied, and the progress of the disease impeded. But, the actual cautery is the only means, that has been found effectual, in stopping the fatal progress of bad cases of hospital ulcer, and the iron is applied red hot, so as to produce an eschar on every point of the surface of the sore." (See *Sketches of the Medical Schools of Paris by J. Cross p.* 84.)

It is well known, that the celebrated Desault often employed the actual cautery to destroy fungous tumors of the antrum. (See *Antrum.*) The same practice is still followed by Pelletan and other eminent surgeons in France. Mr. Cross saw it adopted in one such case with good effect. (*P.* 86.) That part of the fungus, which can be cut away, is to be so removed, and the deeper portion, out of the reach of the knife, is to be cauterized. If there be any case in surgery, justifying the use of a red hot iron, it is certainly a fungus of the antrum. But, even in this instance, I should prefer any other certain mode of destroying the root of the disease.

**CELOTOMIA.** (from κηλη, a tumour or hernia, and τεμνω, to cut.) This has two meanings, viz. the operation for a hernia, and castration.

**CERATOTOME.** (from κερας, a horn, and τεμνω, to cut.) This is the name given by Wenzel to the knife, which he was in the habit of using to divide the cornea, or horny coat of the eye.

**CERATUM CALAMINÆ.** (L.) A good simple dressing.

**CERATUM CALOMELANOS.** ℞. *Calom.* ʒi. *Cerati Lapid. Calamin.* ℥ss. M. Some practitioners are partial to this as a dressing for chancres.

**CERATUM CETACEI.** (L.) The spermaceti cerate. A mild unirritating salve for common purposes.

**CERATUM CICUTÆ.** ℞. *Unguenti Cicutæ* lbj. (See *Unguentum.*) *Spermatis Ceti* ℥ij. *Ceræ Albæ,* ℥iij. M. One of the formulæ at St. Bartholomew's Hospital, occasionally applied to cancerous, scrofulous, phagedenic, herpetic, and other inveterate sores.

**CERATUM LYTTÆ.** (L.) This, which was lately called the cerate of cantharides, was once much used for stimulating blistered surfaces, in order to maintain a discharge. The ceratum sabinæ, however, has almost rendered this application useless, as it answers much better, and is not attended with the danger of bringing on strangury, inflammation of the bladder, &c.

**CERATUM PLUMBI SUPERACETATIS.** (L. Acetite of lead.) A very eligible, mildly astringent, unirritating salve.

**CERATUM PLUMBI COMPOSITUM.** (L.) Lately the ceratum lithargyri acetati. This is an excellent, unirritating, cooling salve for common purposes.

**CERATUM SABINÆ.** ℞. *Sabinæ Recentis Contusæ Ceræ Flavæ,* sing. lbj. *Adipis Suillæ,* lbiv. Mix the savin with the melted wax and hog's lard, and strain the composition.

This is the famous application for keeping open blisters, on the plan recommended by Mr. Crowther. We have noticed in the article *Blisters,* what he says on the subject in the last edition of his work.

**CERATUM SAPONIS.** (L.) ℞. *Lithargyri lævigati lib.* j. *Aceti cong.* j. *Saponis unc.* viij. *Olei olivæ. Ceræ flavæ sing. lib.* j.

This is the *soap cerate* of St. Bartholomew's Hospital, and adopted by the College. In preparing it, the utmost caution must be used. The three first ingredients are to be mixed together and boiled gently till all the moisture is evaporated; after which, the wax and oil, previously melted together, must be added. The whole composition, from first to last, must be incessantly and effectually stirred, without which the whole will be spoiled. This formula was introduced into practice by Mr. Pott, and is found to be a very convenient application for fractures, and also as an external dressing for ulcers; being of a very convenient degree of adhesiveness, and at the same time possessing the usual properties of a saturnine remedy.

In applying this cerate, spread on linen, in fractures of the leg or arm, one caution is necessary to be observed, namely, that it be in two distinct pieces; for if, in one piece, the limb be encircled by it, and the ends overlap each other, it will form a very inconvenient and partial constriction of the fractured part, in consequence of the subsequent tumefaction. (*Pharm. Chirurg.*)

**CEREBRUM.** The brain; for concussion of; compression of, &c. see *Head, Injuries of.* For inflammation of, see *Phrenitis.* For hernia of, see *Hernia Cerebri.*

**CERU'MEN AURIS.** A degree of deafness is frequently produced by the lodgment of dry pieces of this substance in the meatus auditorius. The best plan, in such cases, is to syringe the ear with warm water, which should be injected with moderate force.

In some instances, deafness seems to depend on a defective secretion of the cerumen, and a consequent dryness of the meatus. Here, it is advisable to introduce a drop or two of sweet oil every now and then into the ear, and to apply fomentations.

**CERUSSA ACETATA.** Sugar of lead. Acetite of lead. This preparation, which is now named by the college *plumbi superacetas*, is well known as an ingredient in a variety of lotions and collyria. It has the qualities of saturnine applications in general, being highly useful for diminishing inflammation.

**CHALAZIUM.** (from χαλαζα, a hailstone.) This signifies a little tubercle on the eyelid, which has been whimsically supposed to resemble a hail-stone. It is the same as the hordeolum or stye. (See *Hordeolum.*)

**CHAMOMILE.** The flowers, which are bitter and aromatic, are used in surgery, for making fomentations.

**CHANCRE.** (from ϰαρϰινος, *cancer venereus.*) A sore which arises from the direct application of the venereal poison to any part of the body. Of course it almost always occurs on the genitals. Such venereal sores, as break out from a general contamination of the system, in consequence of absorption, never have the term *chancre* applied to them. (For an account of the nature and treatment of chancres, see *Venereal Disease.*)

**CHARPIE.** (French.) Scraped linen, or lint.

**CHEILOCA'CE.** (from χειλος, the lip, and ϰαϰον, an evil.) A swelling, or ulceration of the lip. The same disease as the *Cancrum Oris*, which see.

**CHEMOSIS.** (from χαινω, to gape.) When ophthalmy or inflammation of the eye, is very violent, it frequently happens, that one or more vessels become ruptured on the side next the eyeball, and a quantity of blood is effused into the cellular membrane, which connects the conjunctiva with the anterior hemisphere of the eye. Hence, the conjunctiva becomes gradually elevated upon the eyeball, and projects towards the eyelids, so as to conceal within it the cornea, which appears as if it were depressed. (*Scarpa.*) In this way the middle of the eye assumes the appearance of a gap, or aperture.

When blood is extravasated under the tunica conjunctiva, there cannot be an easier or more effectual remedy than æther. A few drops are to be poured into the palm of the hand, and diffused over it, which may be immediately done by pressing the other hand against it. The hand is then to be applied to the eye, and kept so close to it, that the spirit, as it evaporates, may insinuate itself into the part affected, and act on the blood, so as to disperse it. (*Ware on Ophthalmy.*)

In a few instances of chemosis, in which the swelling and inflammation of the conjunctiva have been great, the following application has been found particularly beneficial, after free evacuations: ℞. *Interiorum foliorum recentium Lactucæ Sissilis,* ℥iij. *Coque cum Aq. Pur.* ℥ss. *In balneo mariæ pro semihora; tunc exprimatur succus, et applicetur paululum ad oculos et ad palpebras, sæpe in die.* (*Ware.*)

Ophthalmy, attended with chemosis, demands the most rigorous employment of the antiphlogistic treatment. Both general and topical bleeding should be speedily and copiously put in practice, with due regard, however, to the age and strength of the patient. Leeches should be applied to the vicinity of the eyelids, or, what is preferable, the temporal artery should be opened. When the chemosis is very considerable, the distention of the conjunctiva may be relieved by making an incision into this membrane, near its junction with the cornea. (See *Ophthalmy.*)

**CHEVASTER** or **Cheva'stre.** A double headed roller, the middle of which was applied to the chin. The bandage then crossed at the top of the head, and passed on each side to the nape of the neck, where it crossed again. Then it was carried up to the top of the head, and so on, till all the roller was exhausted.

CHIA'STRE. A bandage for stopping hemorrhage from the temporal artery. The roller employed is double headed, about an inch and a half wide, and four ells long. The middle of the roller is applied to the unwounded side of the head: the bandage is carried round to the bleeding temple, and there made to cross over a compress on the wound. The roller is then continued over the coronal suture, and under the chin, care being taken to make the bandage cross upon the compress. In this way the roller is applied round the head, till the whole is spent.

**CHILBLAINS** are the effect of inflammation, arising from cold. A chilblain, in its mildest form, is attended with a moderate redness of the skin, and a sensation of heat and itching, all which symptoms, after a time, spontaneously disappear. In a more violent degree, the swelling is larger, redder, and sometimes of a dark blue colour; and the heat, itching, and pain, are so excessive, that the patient cannot use the part. In the third degree small vesicles arise upon the tumour, which burst and leave excoriations. These are soon converted into ill-conditioned sores, which sometimes penetrate even as deeply as the bone, discharge a thin ichorous matter, and generally prove very obstinate. The worst stage of chilblains is attended with sloughing.

Chilblains are particularly apt to occur in persons, who are in the habit of going immediately to the fire, when they come home in winter with their fingers and toes very cold; they are also particularly frequent in persons, who often go suddenly into the cold, while very warm. Hence, the disease most commonly affects parts of the body, which are peculiarly exposed to these sudden transitions; for instance, the nose, ears, lips, hands, and feet. Richter remarks that they are still more frequently occasioned, when the part, suddenly exposed to cold, is in a moist perspiring state, as well as a warm one. Young subjects are much more liable to this troublesome complaint than adults; and females brought up in a very delicate manner, are generally more afflicted, than the other sex.

The most likely plan of preventing chilblains is to accustom the skin to moderate friction; to avoid hot rooms and making the parts too warm; to adapt the quantity and kind of clothing to the state of the constitution, so as to avoid extremes, both in summer and winter; to wash the parts frequently with cold water; to take regular exercise in the open air in all weathers; and to take particular care not to go suddenly into a warm room, or very near the fire, out of the cold air.

Although chilblains of the milder kinds are only local inflammations, yet they have some peculiarity in them, for they are not most benefited by the same antiphlogistic applications, which are most effectual in the relief of inflammation in general.

One of the best modes of curing chilblains of the milder kind is to rub them with snow, or ice-cold water, or to bathe them in the latter, several times a day, keeping them immersed each time, till the pain and itching abate. After the parts have been rubbed or bathed in this way, they should be well dried with a towel, and covered with flannel or leather socks.

This plan is perhaps as good a one as any; but it is not that which is always congenial to the feelings and caprice of patients; with the constitutions of some it may even disagree. In such cases, the parts affected may be rubbed with spirit of wine, linimentum saponis, tinctura myrrhæ, or a strong solution of alum, or vinegar. A mixture of oleum terebinthinæ and balsamum copaivæ, in equal parts, is a celebrated application. A mixture of two parts of camphorated spirit of wine, and one of the aqua lithargyri acetati, has also been praised. Mr. Wardrop speaks highly of one part of the tincture of cantharides with six of the soap liniment.—(*Medico-Chir. Trans. Vol.* 5, *p.* 142.)

When chilblains have suppurated and ulcerated, the sores require stimulating dressings, such as lint dipped in a mixture of the aqua lithargyri acetati, and aqua calcis; in tinctura myrrhæ, or warm vinegar. If a salve be employed, one which contains the hydrargyrus nitratus ruber, is best. Ulcers of this kind frequently require being touched with the argentum nitratum, or dressed with a solution of it.

Chilblains, attended with sloughing, should be poulticed, till the dead parts are detached. The sores should then be first dressed with some mildly stimulating ointment, such as the unguentum resinæ flavæ. With this, in a day or two, a little of the hydrargyrus nitratus ruber may be mixed; but the surgeon should not venture on the employment of very irritating applications, till he sees what the parts will bear, and whether such will be requisite at all. Were he too bold, immediately he leaves off the poultices, he might even bring on sloughing again.

*The reader may find a long list of applications for chilblains in Rees's Cyclopædia, article Chilblains. See also Richter's Anfangsgr. der Wundarzn. Band.* 1. *Thomson's Lectures on Inflammation, p.* 637, *&c. Lassus, Pathologie Chirurg. T.* 2, *p.* 388, *&c. Léveillé Nouvelle Doctrine Chir. T.* 4, *p.* 352, *&c. Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 1, *p.* 304,

*&c. Edit.* 1798. *Pearson's Principles of Surgery, p.* 153, *&c. Edit.* 1808.

CHIMNEY-SWEEPER'S CANCER. See *Scrotum.*

CHORDEE. (French, from χορδη, a cord.) When inflammation is not confined merely to the surface of the urethra, but affects the corpus spongiosum, it produces in it an extravasation of coagulable lymph, as in the adhesive inflammation, which uniting the cells together, destroys the power of distention of the corpus spongiosum urethræ, and makes it unequal in this respect to the corpora cavernosa penis, and therefore a curvature takes place at the time of an erection, which is called a *chordee.* The curvature is generally in the lower part of the penis. When the chordee is violent, the inner membrane of the urethra is so much upon the stretch, that it may be torn, and cause a profuse bleeding from the urethra, that often relieves the patient, and even sometimes proves a cure. (*Hunter on the Venereal.*)

This is the *inflammatory* chordee; there is another kind, which has been named *spasmodic.*

In the beginning of the inflammatory chordee, bleeding from the arm is often of service; but it is more immediately useful to take away blood from the part itself by leeches; for we often find, that when a vessel gives way, and bleeds a good deal, the patient is greatly relieved. Relief may often be obtained by exposing the penis to the steam of hot water. Poultices have also beneficial effects; and both fomentations and poultices will often do more good when they contain camphor. Opium, given internally, is of singular service; and if it be joined with camphor, the effect will be still greater.

When the chordee continues after all inflammation is at an end, no evacuations are required. The consequence of the inflammation will cease gradually by the absorption of the extravasated coagulating lymph. Mercurial ointment rubbed on the part will considerably promote this event. Cicuta has seemed to do considerable good, after the common methods of cure have not availed. Electricity may be of service. A chordee is often longer in going off, than any other consequence of a gonorrhæa, but it disappears at last.

Camphorated mercurial ointment is better than the simple unguentum hydrargyri, to bring about the removal of the extravasated lymph.

The *spasmodic chordee* is very much benefited by bark. (*Hunter on the Venereal.*)

CHYLOPOIETIC ORGANS, or VISCERA. The parts of the body concerned in the preparation of the chyle, as the liver, gall bladder, pancreas, small intestines, &c. These viscera, with the stomach, compose what some surgical authors name the *gastric system*, and a disordered state of their functions is supposed to be the cause of many medical and surgical diseases. The continental surgeons, perhaps, extend this doctrine beyond the bounds of truth. In our own country, Mr. Abernethy has particularly drawn the attention of practitioners to the subject, which has excited considerable interest and discussion throughout the profession.

CICATRIX. The scar remaining on the skin, after the healing of a wound or ulcer.

CICATRIZATION. The process by which wounds and sores heal. Granulations having been formed, the next object of nature is to cover them with skin. The parts which had receded by their natural elasticity, in consequence of the breach made in them, now begin to be brought together by the contraction of the granulations. The contraction takes place in every point, but principally from edge to edge, which brings the circumference of the sore towards the centre, so that the sore becomes smaller and smaller, even although little, or no new skin is formed.

The contracting tendency is in some degree proportioned to the general healing disposition of the sore, and looseness of the parts. When granulations are formed upon a fixed surface, their contraction is mechanically impeded; as, for instance, on the skull, the shin, &c. Hence, in all operations on such parts, as much skin should be saved as possible.

When there has been a loss of substance, making a hollow sore, and the contraction of the granulations has begun, and made a good deal of progress, before they have had time to rise as high as the skin, then the edges of the skin are generally drawn down, and tucked in by it, in the hollow direction of the surface of the sore.

The contraction of the granulations continues, till the healing is complete; but it is greatest at first. That there is a mechanical resistance to such contraction, is proved by the assistance, which may be given to the process by the application of a bandage.

Besides the contractile power of the granulations, there is also a similar power in the surrounding edge of the cicatrizing skin, which assists the contraction of the granulations, and is generally more considerable than that of the granulations themselves, drawing the mouth of the wound together, like a purse. The contractile power of the skin is confined principally to the very edge, where it is cicatrizing, and, as Mr. Hunter believed, to those very granulations, which have already cicatrized; for, the natural or original skin surrounding this edge does not contract, or at least not nearly so much, as appears by its having been thrown into folds and plaits, while the new skin is smooth and shining.

The uses of the contraction of granulations are various. It facilitates the healing of a sore, as there are two operations going on at the same time, viz. contraction and skinning.

It avoids the formation of much new skin, the advantage of which is evident; for it is with the skin as with all other parts of the body, viz. that such as are originally formed are much fitter for the purposes of life, than those which are newly formed, and not nearly so liable to ulceration.

When the whole surface of a sore has skinned over, the substance, the remains of the granulations, on which the new skin is formed, still continues to contract, till hardly any thing more is left than what the new skin stands upon. This is a very small part, in comparison with the first formed granulations, and it in time loses most of its apparent vessels, becoming white and ligamentous. All newly healed sores are at first redder than the common skin, but in time they become much whiter.

As the granulations contract, the surrounding old skin is stretched to cover the part, which had been deprived of skin.

When a sore begins to heal, the surrounding old skin, close to the granulations, becomes smooth, and rounded with a whitish cast, as if covered with something white. This, Mr. Hunter supposed to be a beginning cuticle, and it is as early and sure a symptom of healing as any. While the sore retains its red edge all round, for perhaps a quarter, or half an inch in breadth, we may be certain it is not in a healing state.

Skin is a very different substance, with respect to texture, from the granulations upon which it is formed; but it is not known, whether it is a new substance formed by the granulations, or a change in the surface of the granulations themselves.

The new skin most commonly takes its rise from the surrounding old skin, as if elongated from it; but not always. In very large sores, but principally old ulcers, in which the edges of the surrounding skin have but little tendency to contract, and the cellular membrane underneath to yield, or the old skin to become drawn over the ulcerated surface, the nearest granulations do not acquire a cicatrizing disposition. In such cases, new skin forms in different parts of the ulcer, standing on the surface of the granulations, like little islands.

Whatever change the granulations undergo to form new skin, they are generally guided to it by the surrounding skin, which gives this disposition to the surface of the adjoining granulations.

The new-formed skin is never so large as the sore was, on which it is formed, owing to the contraction of the granulations, and the yielding of the surrounding old skin. If the sore is situated where the adjoining skin is loose, as in the scrotum, then the contractile power of the granulations being quite free from obstruction, a very little new skin is formed; but if the sore is situated where the skin is fixed or tense, the new skin is nearly as large as the sore.

The new skin is at first commonly on the same level with the old. This however is not the case with scalds and burns, which frequently heal with a cicatrix, higher than the skin, although the granulations have been kept from rising higher than this part.

The new-formed cutis is neither so yielding nor so elastic as the original is; it is also less moveable. It gradually becomes, however, more flexible and loose. At first it is very thin and tender, but it afterwards becomes firmer and thicker. It is a smooth continued skin, not formed with those insensible indentations, which are observed in the natural or original skin, and by which the latter admits of any distention, which the cellular membrane itself will allow of.

This new cutis, and indeed all the substance which had formerly been granulations, is not nearly so strong, nor endowed with such lasting and proper actions, as the originally formed parts. The living principle itself is less active; for when an old sore breaks out, it continues to yield, till almost the whole of the new-formed matter has been absorbed, or has mortified.

The young cutis is extremely full of vessels; but these afterwards disappear, and the part becomes white.

The surrounding old skin, being drawn toward the centre by the contraction of the granulations, is thrown into loose folds, while the new skin itself seems to be upon the stretch, having a smooth shining appearance.

The new cuticle is more easily formed from the cutis, than the cutis itself from granulations. Every point of the surface of the cutis is concerned in forming cuticle, so that this is forming equally every where at once; but the formation of the cutis is principally progressive from the adjoining skin.

The new cuticle is at first very thin, and rather pulpy than horny. As it becomes stronger, it looks smooth and shining, and is more transparent than the old cuticle.

The rete mucosum is later in forming

than the cuticle, and in some cases never forms at all. In blacks who have been wounded, or blistered, the cicatrix is a considerable time before it becomes dark; and in one black, whom Mr. Hunter saw, the scar of a sore, which had been upon his leg when young, remained white when he was old. Many cicatrices of blacks, however, are even darker than any other parts of the skin. (*Hunter on the Blood, Inflammation, &c. The reader may also consult Thomson's Lectures on Inflammation, p.* 399, *&c.*)

CICUTA. (*Conium Maculatum. Hemlock.*) This is a medicine, to which my observations in practice incline me to impute considerable efficacy in several surgical diseases. However, there is no doubt, that when it is represented as a certain cure for cancer, and scrofula, exaggeration is employed. It is an excellent remedy for irritable painful sores of the scrofulous kind, and it will complete the cure of many ulcers, in which the venereal action has been destroyed by mercury, though the healing does not proceed in a favourable way. Cicuta is likewise beneficial to several inveterate malignant sores, particularly, some which are every now and then met with upon the tongue. It is an eligible alterative in cases of noli me tangere, tinea capitis, and various herpetic affections. I have seen several enlargements of the female breast give way to hemlock conjoined with calomel. Some swellings of the testes also yield to the same medicines. Cicuta certainly has not the power of curing cancer; but, its narcotic anodyne qualities tend to lessen the pain of that distemper, so as to render it by no means a contemptible remedy in that intractable kind of case.

Respecting hemlock, Mr. Pearson observes, that the extract and powder may be sometimes given with evidently good effect in spreading irritable sores; whether they are connected with the active state of the venereal virus, or whether they remain after the completion of the mercurial course; and it would seem, that the benefit, conferred by this drug, ought not to be ascribed solely to its anodyne qualities, since the same advantages cannot always be obtained by the liberal exhibition of opium, even where it does not disagree with the stomach. He states, that cicuta is almost a specific for the venereal ulcers, which attack the toes at their line of junction with the foot, and which frequently become gangrenous. Also, in spreading sores, which are accompanied with great pain, and no appearance of remarkable debility, hemlock will often do more than bark, vitriol, or cordials. (*Pearson on Lues Venera.*) The common mode of exhibiting hemlock is in the form of pills, made of the extractum conii, five grains to each. However, I have always thought three grains sufficient to begin with, the dose being afterwards gradually augmented. It is curious how large a quantity may at last be taken in this manner. Mr. J. Wilson, in his Pharmacopœia Chirurgica, informs us of a remarkable case of a cancerous ulcer, for which the patient took a hundred and twenty pills, each consisting of five grains of the extractum conii, in twenty-four hours, and this without any benefit being produced, or any inconvenience to the patient.

The stomach being a little disordered, and the head somewhat giddy, is a sign of the dose being sufficiently strong.

" According to some writers, but more particularly Dr. Withering, there are several ways in which the views of a medical practitioner, in prescribing this remedy, may be frustrated. The plant chosen for preparing the extract, may not be the true *conium maculatum*, which is distinguished by red spots along the stalk. It may not be gathered when in perfection, namely, when beginning to flower. The inspissation of the juice may not have been performed in a water-bath, but, for the sake of dispatch, over a common fire. The leaves, of which the powder is made, may not have been cautiously dried and preserved in a well stopped bottle; or if so, may still not have been guarded from the ill effects of exposure to light. Or, lastly, the whole medicine may have suffered from the mere effects of long keeping. From any of these causes, it is evident, the powers of cicuta may have suffered; and it happens, no doubt, very frequently, that the failure of it ought, in fact, to be attributed to one or other of them." (*Pharmacopœia Chirurgica, published in* 1802, *p.* 174.)

I have sometimes prescribed as an alterative, with manifest benefit in several surgical diseases, a pill, containing three grains of extractum conii, one of hydrargyri submurias (calomel,) and one of antimonii sulphuretum præcipitatum.

CINCHONA. As one of the designs of this dictionary is to embrace the subjects of a surgical pharmacopœia, peruvian bark, which is administered in a multiplicity of surgical cases, cannot be passed over in silence.

Its great repute for its virtues in stopping mortifications, and accelerating the separation of the sloughs, every person, whether of the medical profession or not, has frequently heard of. Indeed, so high is the character of the medicine, that many practitioners order it in some stage, or another, of almost every distemper, often prescribe it when it is totally useless, give it when it actually does harm, and make their patients swallow such quantities as operate perniciously, when smaller doses would effect striking benefit. Some men are credulous enough to think, that from the peruvian bark vigor and strength are directly extricated, and infused into the constitution, in exact proportion to the quantity of the medicine, which the stomach will keep down and digest.

While a doctrine of this sort prevails, we must expect to see indiscriminate and erroneous practice. The generality of diseases will always be attended with an appearance of languor and weakness, and, certainly, while there exists a supposition, that a drug is at hand, possessing the quality of evolving and communicating strength, it would be absurd to fancy, that so important an article will not be largely exhibited in a multiplicity of surgical cases. I shall not presume to hazard an idea of the powers of the peruvian bark in the practice of physic; but, I have not the least doubt, that they have been unwarrantably exaggerated in surgery, so as to blind and prejudice many a practitioner of good abilities, and lead him to adopt injudicious and hurtful methods of treatment.

Under particular circumstances, bark has undoubtedly the quality of increasing the tone of the digestive organs; and, of course, whenever the indication is to strengthen the system by nourishing food, and the appetite fails, this medicine may prove of the highest utility, provided it is given in moderate doses, and it appears to agree with the stomach and bowels. But, the plan of making the patient swallow as much of the medicine as can be got into his stomach, must, in my opinion, be invariably followed by bad, instead of good effects. How can it be reasonably expected, that the stomach, which is already out of order, can be set right by having an immoderate quantity of any drug whatever forced into it? In fact, if the alimentary canal were in a healthy state, must not such practice be likely to throw it into a disordered condition?

Bark is an excellent medicine, when judiciously administered; but, like every other good medicine, in bad hands, it may be the means of producing the worst consequences. How much good does mercury effect in an infinite number of surgical diseases, when prescribed by a surgeon of understanding; what a poison it becomes under the direction of an ignorant practitioner! With respect to cases of mortification, bark is often most strongly indicated, when the sloughing is not surrounded with active inflammation, when the patient is debilitated, and his stomach cannot take nutritious food. I have always regarded the notion of giving bark, as a specific for gangrene, as totally unfounded and absurd. I have watched its effects in these cases, and could never discern, that it had the least peculiar power of operating directly upon the parts, which are distempered. Whatever good it does, is by its improving the tone of the digestive organs, and making them more capable of conveying nourishment, and, of course, strength into the constitution.

I should feel myself guilty of a degree of presumption in speaking thus freely upon this subject, were not my sentiments in some measure supported by those of certain surgical writers, the remembrance of whom will always be hailed with unfeigned veneration and esteem. Mr. Samuel Sharp was not bigoted to bark, and, while he allowed it to possess a share of efficacy, he would not admit, that it was capable of miraculously accomplishing every thing, which the ignorant or prejudiced alleged. "I know," says he, "it will be looked upon by many as a kind of scepticism, to doubt the efficacy of a remedy, so well attested by such an infinity of cases; and, yet, I shall frankly own, I have never clearly to my satisfaction, met with any evident proofs of its preference to the cordial medicines usually prescribed; though I have a long time made experiment of it with a view to search into the truth.

"Perhaps, it may seem strange, thus to dispute a doctrine established on what is called matter of fact; but, I shall here observe, that in the practice of physic and surgery, it is often exceedingly difficult to ascertain a fact. Prejudice, or want of abilities, sometimes misleads us in our judgment, where there is evidently a right and a wrong; but, in certain cases, to distinguish how far the remedy, and how far nature operate, is probably above our discernment. In gangrenes, particularly, there is frequently such a complication of unknown circumstances, as cannot but tend to deceive an unwary observer. Mortifications arising from mere cold, compression, or stricture, generally cease upon removing the cause, and are, therefore, seldom proper cases for proving the power of the bark. However, there are two kinds of gangrene, where internals have a fairer trial; those are a spreading gangrene from an internal cause, and a spreading gangrene from violent external accidents, such as gunshot wounds, compound fractures, &c. Yet, even here we cannot judge of their effect with absolute certainty; for, sometimes, a mortification from internal causes is a kind of critical disorder. There seems to be a certain portion of the body destined to perish, and no more; of this we have an infinity of examples brought into our hospitals, where the gangrene stops at a particular point, without the least assistance from art. The same thing happens in the other species of gangrene from violent accidents, where the injury appears to be communicated to a certain distance, and no farther; though, by the way, I shall remark in this place, contrary to the received opinion, that gangrenes from these accidents, (where there has been no previous straitness of bandage,) are as often fatal, as those from internal causes.

"As I have here stated the fact, we see how difficult it is to ascertain the real efficacy of this medicine; but, had bark in any degree, those wonderful effects in gangrenes, which it has in periodical complaints, its pre-eminence would no more be doubted in the one case, than in the other. What, in my judgment, seems to have raised its character so high, are the great numbers of single observations published on this subject, the authors of which not having frequent opportunities of seeing the issue of this disorder, under the use of cordials, &c. and some of them, perhaps, prejudiced with the common supposition, that every gangrene is of itself mortal, have therefore ascribed a marvellous influence to the bark, when the event has proved successful." (*Sharp's Crit. Enq. chap.* 8, *on Amputation.*)

Some further remarks on this subject will be reserved for the article *Mortification.*

According to Mr. Bromfield, bark is a specific for old ulcers, where the inflammation seems circumscribed at the distance of an inch round the sore, the surface of the ulcer looks glossy, and the discharge is extremely thin and very offensive, with little or no sleep, from the violence of the pain. He further observes, that the addition of opium, as circumstances may require, will often be found necessary. (*Chirurgical Observations and Cases, Vol.* 1, *p.* 132.)

Bark is given so extensively in the practice of surgery, that there are few important cases, in which in certain circumstances, and at some period or another, it is not indicated. When persons have been weakened by a course of mercury, or by the effects of any disease whatsoever, moderate doses of bark will frequently be found of great service. But, it only becomes so on the principles above suggested, and, as far as my judgment extends, this medicine should never be prescribed in any surgical cases in excessive and unreasonable quantities.

The yellow bark, or the cortex cinchonæ cordifoliæ of the new pharmacopœia, is said to possess more efficacy, than the other kinds.

CINNABAR ARTIFICIAL. (*Hydrargyri Sulphuretum rubrum.*) Is chiefly employed by surgeons for fumigating venereal ulcers. An apparatus is sold in the shops for this purpose. The powder is thrown upon a heated iron, and the smoke is conducted by means of a tube to the part affected.

CIRCUMCISION. (from *circumcido*, to cut round.) The operation of cutting off a circular piece of the prepuce, sometimes practised in cases of phymosis. (See *Phymosis.*)

CIRSOCELE. (from κιρσος, a varix, and κηλη, a tumour.) The cirsocele is a varicose distention and enlargement of the spermatic vein; and whether considered on account of the pain, which it sometimes occasions, or on account of a wasting of the testicle, which, now and then follows, it may truly be called a disease. It is frequently mistaken for a descent of a small portion of omentum. The uneasiness which it occasions, is a dull kind of pain in the back, generally relieved by suspension of the scrotum. It has been resembled to a collection of earth-worms; but whoever has an idea of a varicose vessel, will not stand in need of an illustration by comparison. It is most frequently confined to that part of the spermatic process, which is below the opening in the abdominal tendon; and the vessels generally become rather larger, as they approach the testis. Mr. Pott never knew any good effect from external applications of any kind.

In general the testicle is perfectly unconcerned in, and unaffected by, this disease; but it sometimes happens, that it makes its appearance very suddenly, and with acute pain, requiring rest and ease; and sometimes after such symptoms have been removed, Mr. Pott has seen the testicle so wasted as hardly to be discernible. He has also observed the same effect from the injudicious application of a truss to a true cirsocele; the vessels, by means of the pressure, became enlarged to a prodigious size, but the testicle shrunk to almost nothing. (*Pott's Works, Vol.* 2.)

The cirsocele is more frequently than any other disorder, mistaken for an omental hernia. As Mr. Astley Cooper remarks, when large it dilates upon coughing; and it appears in an erect, and retires in a recumbent, posture of the body. There is only one sure method of distinguishing the two complaints: place the patient in a horizontal posture, and empty the swelling by pressure upon the scrotum; then put the fingers firmly upon the upper part of the abdominal ring, and desire the patient to rise; if it is a hernia, the tumour cannot re-appear, as long as the pressure is continued at the ring; but if a cirsocele, the swelling returns with increased size, on account of the return of blood into the abdomen being prevented by the pressure. (*A. Cooper on Inguinal Hernia.*)

The cirsocele can generally only be palliated, and seldom radically cured. When the complaint is attended with pain, cold saturnine, and alum, lotions may be applied to the testicle and spermatic cord. At the same time, blood should be repeatedly taken away by means of leeches; the bowels should be kept gently open; the patient should be placed in a horizontal posture; and the testicle should be supported in a bag-truss.

In general, the patient only finds it necessary to keep up the testicle by this kind of suspensory bandage.

Gooch, and other writers, have related cases of cirsocele, in which the pain was so intolerable and incurable, that nothing but castration could afford the patient any relief.

**CLAP.** (See *Gonorrhœa.*)

**CLAVUS.** (a nail.) In Amatus Lusitanus, a kind of instrument for enabling persons with carious palates, to articulate better. Also, a hard tubercle in the uterus. Clavus besides signifies the common little tumour well known by the name of corn. (See *Corns.*)

**COLLYRIUM.** (from κωλυω, to restrain, because it stops the inflammation.) An application to the eyes, and generally an eye-water.

The following are some of the most useful collyria.

**COLLYRIUM ACIDI ACETICI.** ℞ Aceti Distillati ℥j. Spiritus Vini Tenuioris ℥ss. Aq. Rosæ ℥viij. Misce. The strength to be diminished, or increased, as circumstances may require. This collyrium is recommended for weak watery eyes, and for relieving pain in these organs, after exerting them on any objects. It is also said to be useful for the scrofulous ophthalmy. (See *Wilson's Pharm. Chir. p.* 66.)

**COLLYRIUM ALUMINIS.** ℞. Aluminis purif. ℈j. Aq. rosæ ℥vj. This is a good astringent collyrium, employed at Guy's Hospital.

**COLLYRIUM AMMONIÆ ACETATÆ.** ℞. Aq. ammon. acet. Aq. rosæ sing. ℥j. M.

**COLLYRIUM AMMONIÆ ACETATÆ CAMPHORATUM.** ℞. Collyrii ammon. acet. Misturæ camphoratæ sing. ℥ij. M.

**COLLYRIUM AMMONIÆ ACETATÆ OPIATUM.** ℞. Collyrii ammon. acet. ℥iv. Tinct. opii. gutt. xl. M.

**COLLYRIUM CERUSSÆ ACETATÆ.** ℞. Aquæ rosæ ℥vj. Cerussæ Acetatæ ʒss. Misce. This is a good application to the eyes, when one of a gently astringent, cooling quality is indicated.

**COLLYRIUM CUPRI VITRIOLATI CAMPHORATUM.** ℞. Aq. Cupri vitriolati camphoratæ ʒij. Aq. distillatæ ℥iv. M. Recommended by Mr. Ware, for the purulent ophthalmy of children.

**COLLYRIUM HYDRARGYRI MURIATI.** ℞. Hydrarg. muriati grss. Aq. distillat. ℥iv. M. This collyrium is fit to be employed, after the acute stage of the ophthalmy has for some time subsided, and it will disperse many superficial opacities of the cornea.

**COLLYRIUM LITHARGYRI ACETATI.** ℞. Aq. distillatæ ℥iv. Aq. litharg. acet. gutt. x. M.

**COLLYRIUM OPIATUM.** ℞. Opii Extracti gr. x. Camphoræ gr. vj. Aquæ distillatæ ferventis ℥ xii. Beat the two first ingredients together in a mortar, and mix the hot water gradually, and strain the fluid.

This collyrium is recommended in some ophthalmies attended with great pain and swelling. (See *Wilson's Pharm. Chir. p.* 70.)

**COLLYRIUM ZINCI VITRIOLATI.** Zinci vitriol. gr. v. Aq. distillatæ ℥iv. M. This is the most common collyrium of all: it may be gradually made stronger.

**COLLYRIUM ZINCI VITRIOLATI CUM MUCILAGINE SEMINIS CYDONII MALI.** ℞. Aq. plantaginis ℥iv. zinci vitriol. gr. v. et mucil. sem. cydon. mal. ℥ss. M.

In order to check the morbid secretion from the eye-lids, in cases of the fistula lachrymalis, or what Scarpa calls *il flusso palpebrale puriforme*, this celebrated Professor recommends a few drops of the above collyrium to be insinuated between the eye-lids and eye.

**COLON,** *Fruit Stones lodged in.* (See *Alvine Concretions.*)

**COLPOCELE.** (from κολπος, the vagina, and κηλη, a tumour.) A tumour, or hernia, situated in the vagina.

**COLPOPTOSIS.** (from κολπος, the vagina, and πιπτω, to fall down.) A bearing or falling down of the vagina. (See *Vagina, Prolapsus of.*)

**COMA.** (from κω or κεω, to lie down.) Anciently any total suppression of the powers of sense; but now it means a lethargic drowsiness. It is a symptom of several surgical disorders.

**COMMINUTED.** (from *comminuo*, to break in pieces.) A fracture is termed *comminuted*, when the bone is broken into several pieces.

**COMPRESS.** (from *comprimo*, to press upon.) Folded linen, lint, or other materials, making a sort of pad, which surgeons place over those parts of the body on which they wish to make particular pressure, and, for this purpose, a bandage is usually applied over the compress. Compresses are also frequently applied to prevent the ill effects, which the pressure of hard bodies, or tight bandages, would otherwise occasion.

**COMPRESSION OF THE BRAIN.** (See *Head, Injuries of.*)

**CONCUSSION OF THE BRAIN.** (See *Head, Injuries of.*)

**CONDUCTOR.** (from *conduco*, to

guide.) A surgical instrument for directing the knife in certain operations. It is more commonly called a *director*.

**CONDYLOMA.** (from κονδυλος, a tubercle, or knot.) A small very hard tumour. The term is generally applied to excrescences of this description about the anus. The practitioner may either destroy them with the lapis infernalis, tie their base with a ligature, so as to kill them, or remove them at once, with a knife: the first is generally the worst; the last the best and most speedy method.

**CONGESTION.** (from *congero*, to amass.) A collection of pus, particularly one of the chronic kind.

**CONIUM MACULATUM.** Hemlock. (See *Cicuta.*)

**CONTRA-APERTURA.** (from *contra*, against, and *aperio*, to open.) A counter-opening. An opening made opposite to one that already exists.

**CONTRA-FISSURA.** (from *contra*, against, and *findo*, to cleave.) A crack in the skull opposite to the part on which the blow was given.

**CONTUSED WOUNDS.** See *Wounds.*

**CONTUSION.** (from *contundo*, to bruise.) A bruise.

Slight bruises seldom meet with much attention; but when they are severe, very bad consequences may ensue, and these are the more likely to occur, when such cases are not taken proper care of.

In all severe bruises, besides the inflammation which the violence necessarily occasions, there is an instantaneous extravasation, in consequence of the rupture of many of the small vessels of the part. In no other way can we account for those very considerable tumours, which often rise immediately after injuries of this nature. The black and blue appearance, instantly following many bruises, can only be explained by there being an actual effusion of blood from the small vessels, which have been ruptured. Even largish vessels are frequently burst in this manner, and very considerable collections of blood are the consequence. Blows on the head very often cause a large effusion of blood under the scalp. I have seen four or five ounces thus extravasated.

Besides the rupture of an infinite number of small vessels and extravasation, which attend all bruises, in a greater or less degree, the tone of the fibres and vessels which have suffered contusion, is considerably disordered. Nay, the violence may have been so great, that the parts are from the first deprived of vitality, and must slough.

Parts at some distance from such as are actually struck, may suffer greatly from the violence of the contusion. This effect is what the French have named a *contre-coup*.

The bad consequences of bruises are not invariably proportioned to the force which has operated; much depends on the nature and situation of the part. When a contusion takes place on a bone, which is thinly covered with soft parts, the latter always suffer very severely, in consequence of being pressed, at the time of the accident, between two hard bodies. Hence, bruises of the shin so frequently cause sloughing and troublesome sores. Contusions affecting the large joints are always serious cases; the inflammation occasioned is generally obstinate, and abscesses and other diseases, which may follow, are consequences truly serious enough to excite alarm.

In the treatment of bruises, the practitioner has three indications, which ought successively to claim his attention, in the progress of such cases.

The first is to prevent and diminish the inflammation, which, from the violence done, must be expected to arise. The bruised parts should be kept perfectly at rest, and be covered with linen, constantly wet with the lotio aq. litharg. acet. When there are muscles bruised, they are to be kept in a relaxed position, and never used.

If the bruise should have been very violent, it will be proper to apply leeches, and this repeatedly, and even, in some cases, particularly, when joints are contused, to take blood from the arm. In every instance, the bowels should be kept well open with saline purgatives.

A second object in the cure of contusions, is to promote the absorption of the extravasated fluid by discutient applications. These may at once be employed in all ordinary contusions, not attended with too much violence; for then nothing is so beneficial as maintaining a continual evaporation from the bruised part, by means of the cold saturnine lotion, and, at the same time, repeatedly applying leeches. In common bruises, however, the *lotio ammoniæ muriatæ* (see *this article*) is an excellent discutient application; but most surgeons are in the habit of ordering liniments for all ordinary contusions, and certainly they do so much good in accelerating the absorption of the extravasated blood, that the practice is highly praiseworthy. The linimentum saponis, or the linimentum camphoræ, are as good as any that can be employed. (See *Linimentum.*)

In many cases, unattended with any threatening appearances of inflammation, but in which there is a good deal of blood and fluid extravasated, bandages act very beneficially, by the remarkable power which they have of exciting the action of the lymphatics, by means of the pressure which they produce.

A third object in the treatment of contusions, is to restore the parts to their proper tone. Rubbing the parts with liniments has a good deal of effect in this way. But, notwithstanding such applications, it is often observed, that bruised parts continue for a long while weak, and even swell, and become œdematous, when the patient takes exercise, or allows them to hang down, as their functions in life may require. Pumping cold water two or three times a day, on a part thus circumstanced, is the very best measure which can be adopted. A bandage should also be worn, if the situation of the part will permit. These steps, together with perseverance in the use of liniment, and in exercise gradually increased, will soon bring every thing into its natural state again.

**CORNEA TUNICA.** (from *cornu*, a horn.) The anterior transparent convex part of the eye, which in texture is tough, like horn. It has a structure peculiar to itself, being composed of a number of concentric cellular lamellæ, in the cells of which is deposited a particular sort of fluid. It is covered externally by a continuation of the conjunctiva, which belongs to the class of mucous membranes; and it is lined by a membrane, the tunica humoris aquei, which seems to belong to the serous class.

### FLESHY EXCRESCENCES OF THE CORNEA.

Mr. James Wardrop, in his Essays on the Morbid Anatomy of the Human Eye, has published an excellent chapter on this subject. Besides pterygia, which are treated of in another part of this Dictionary, Mr. Wardrop states, that the cornea is subject to two kinds of caruncles, or fleshy excrescences. One appears at birth, or soon after it, and resembles the nævi materni so frequent on the skin of various parts of the body. The second is described, as having a greater analogy to the fungi, which grow from mucous surfaces, and being in general preceded by ulceration.

Of the congenital excrescence of the cornea, Mr. Wardrop has seen two remarkable instances. The first was in a girl, eight, or ten years of age, on whose left eye, there was a conical mass, the base of which grew from about two-thirds of the cornea, and a small portion of the adjoining sclerotic coat.

The second example occurred in a patient upwards of fifty years old. The tumour had been observed from birth, was about as large as a horse-bean, and only a small portion of it seemed to grow from the cornea. The other part was situated on the white of the eye, next the temporal angle of the orbit. From the middle of the excrescence, upwards of twelve long firm hairs grew, and hung over the cheek.

Mr. Wardrop acquaints us, that a similar tumour, with two hairs growing out of it, was seen at Lisbon by Dr. Barron, of St. Andrews. Mr. Crampton also mentions, that he once saw a "tuft of very strong hairs proceeding from the sclerotica." (*Essay on the Entropeon, p.* 7.) And De Gazelles met with an instance, in which a single hair grew from the cornea. (*Journ. de Médecine, Tom.* 24.) According to Mr. Wardrop, this species of excrescence of the cornea greatly resembles the spots, covered with hair, which are frequent on various parts of the surface of the body.

With regard to the second kind of tumour growing from the cornea, a fungus, proceeding from an ulcer of this part of the eye, is stated to be very uncommon. However, it is said, that, when a portion of the iris protrudes though an ulcer of the cornea, the growth of a large excrescence from the projecting part is not so unusual. Of such a disease, Mr. Wardrop has cited an example from Maître Jean's Traité des Maladies des yeux, Voigtel, Beer, and Plaichner. Excrescences, growing from the cornea, are also quoted from the following works; Handbuch der Pathologischen Anatomie, Von F. G. Voigtel, Halle, 1804. Pratische Beobachtungen über den grauen Staar und die Krankheiten der Hornhaut, von Joseph Beer, Vienna, 1791. Plaichner's Dissertatio, de Fungo Oculi. (See *Wardrop's Essays on the Morbid Anatomy of the Human Eye, chap.* 4.)

The only treatment, which excrescences of the cornea admit of, is to remove them with a scalpel and pair of forceps, or to destroy them with caustic.

### ABSCESSES OF THE CORNEA.

The following description of abscesses of the cornea is taken from Mr. Wardrop's valuable work on the morbid anatomy of the eye.

When the matter is collected between the lamellæ of the cornea, it first appears like a small spot; and, instead of resembling a speck in colour, it is of the yellow hue of common pus. As the quantity of the matter increases, this spot becomes broader, and it does not alter its situation from the position of the head. If it is situated among the external layers of the cornea, or immediately below the corneal conjunctiva, a tumour is formed anteriorly, and, if touched with the point of a probe, the contained fluid can be felt fluctuating within, or if the eye is looked at sideways, an alteration in the form of the cornea may be readily perceived.

When the matter collects, between the interior lamellæ, it does not produce any evident alteration, in the external form of the cornea; but, if it is touched with the point of a probe, a fluctuation can be more or less distinctly perceived, and the spot alters its form, and becomes somewhat broader.

Such collections of matter appear on every part of the cornea. Sometimes they alter their situation by degrees, and sink downwards; and sometimes they change both their situation and form. They very seldom cover more than one-fourth, or one-third of the cornea.

If the quantity of matter is small, it is often completely absorbed during the abatement of the inflammatory symptoms, and it generally leaves no vestige behind it. In other cases, the cornea is eroded externally, producing an ulcer, and subsequent opacity. In some few instances, the internal lamellæ of the cornea give way, and the matter escapes into the anterior chamber. If an artificial opening is made, in order to discharge the matter, it often does not readily flow out; and it is sometimes so tenacious, and contained in a cavity so irregular, that it neither escapes spontaneously, nor can it be evacuated by art.

It is particularly to the cases, in which matter collects between the layers of the cornea, that the terms *unguis*, and *onyx*, are applied. (See *Wardrop's Essays on the Morbid Anatomy of the Human Eye, chap.* 6.)

### OPACITIES OF THE CORNEA.

Opacity of the cornea is one of the worst consequences of obstinate chronic ophthalmy. Scarpa distinguishes the superficial and recent species of opacity from the *albugo* and *leucoma*, (see *these words*,) which are not in general attended with inflammation, assume a clear pearl colour, affect the very substance of the cornea, and form a dense speck upon this coat of the eye. The *nebula*, or slight opacity, here to be treated of, is preceded and accompanied by chronic ophthalmy; it allows the iris and pupil to be discerned through a kind of cloudiness, and consequently does not entirely bereave the patient of vision, but permits him to distinguish objects, as it were, through a mist. The nebula is an effect of protracted or ill treated chronic ophthalmy. The veins of the conjunctiva, much relaxed by the long continuance of the inflammation, become preternaturally turgid and prominent; afterwards they begin to appear irregular and knotty, first in their trunks, then in their ramifications, near the union of the cornea with the sclerotica, and lastly, in their most minute ramifications, returning from the delicate layer of the conjunctiva, spread over the cornea. It is only, however, in extreme relaxation of the veins of the conjunctiva, that these very small branches of the cornea become enlarged.

When this happens, some reddish streaks begin to be perceptible, in the interspaces of which, very soon afterwards, a thin milky albuminous fluid is effused, which dims the diaphanous state of the cornea. The whitish, delicate, superficial speck, thence resulting, forms precisely what is termed, *nebula*, or that kind of opacity here to be considered. And since this extravasation may happen only at one point of the cornea, or in more places, the opacity may be in one speck, or in several distinct ones, but which all together diminish, more or less, the transparency of this membrane.

The cloudiness of the cornea, which sometimes takes place in the inflammatory stage of the violent acute ophthalmy, essentially differs from the species of opacity expressed by the term *nebula*. The first is a deep extravasation of coagulating lymph into the internal cellular texture of the cornea, or else the opacity proceeds from an abscess between the layers of this membrane about to end in ulceration. On the other hand, the nebula forms slowly upon the superficies of the cornea, in the long protracted chronic ophthalmy; is preceded first by a varicose enlargement of the veins in the conjunctiva, next of those in the delicate lamina of this tunic, continued over the front of the cornea; and finally it is followed by an effusion of albuminous lymph into the texture of this thin layer, expanded over the transparent part of the eye. This effusion never elevates itself in the shape of a pustule. Wherever the cornea is affected with this species of opacity, termed *nebula*, the part of the conjunctiva, corresponding to it, is constantly occupied by a network of varicose veins, more knotty and prominent than other vessels of the same description, and though the cornea be clouded at more points than one, there are distinct corresponding fasciculi of varicose veins in the white of the eye. Scarpa injected an eye affected with chronic ophthalmy, and *nebula*, and he found that the wax easily passed, both into the enlarged veins of the conjunctiva, and of that part of the surface of the cornea where the opacity existed; the inosculations all round the margin of the cornea were beautifully variegated, without trespassing that line, which bounds the sclerotica, except on that side, where the cornea was affected with this species of opacity.

This kind of opacity of the cornea,

from its very origin, requires an efficacious plan of treatment; for though at first it may only occupy a small portion of the cornea, when left to itself it advances towards the centre of this membrane, and the ramifications of the dilated veins upon this coat growing still larger, at length convert the delicate continuation of the conjunctiva upon the surface of the cornea, into a dense opaque membrane, obstructing vision.

The curative indication in this disease is to make the varicose vessels resume their natural diameters, or if that be impracticable, to cut off all communication between the trunk of the most prominent varicose veins of the conjunctiva, and the ramifications coming from the surface of the cornea, the seat of the opacity. The first mode of treatment is executed by means of topical astringents and corroborants, especially Janin's ophthalmic ointment, and success attends it, when the opacity is in an early state, and not extensive. But when advanced to the centre of the cornea, the most infallible treatment is the excision of the fasciculus of varicose veins near their ramifications, that is, near the seat of the opacity. By means of this excision, the blood retarded in the dilated veins of the cornea is voided; the varicose veins of the conjunctiva have an opportunity to contract and regain their tone, no longer having blood impelled into them; and the turbid secretion effused in the texture of the layer of the conjunctiva continued over the cornea, or in the cellular substance, connecting these two membranes, becomes absorbed. The celerity, with which the nebula disappears, after this operation, is surprising, commonly in twenty-four hours. The extent to which the excision of the varicose veins of the conjunctiva must be performed, depends upon the extent of the opacity of the cornea. Thus, should there be only one set of varicose vessels, corresponding to an opacity of moderate extent, it is sufficient to cut a portion of them away. Should there appear several dim specks upon the cornea, with as many distinct sets of varicose vessels, arranged round upon the white of the eye, the surgeon must make a circular incision into the conjunctiva, near the margin of the cornea, by which he will certainly divide every plexus of varicose vessels. But let it be observed, that a simple incision through the varicose vessels is not permanently effectual in destroying all direct communication between the trunks and ramifications of these vessels upon the cornea, after such an incision made, for instance, with a lancet; though it be true that a separation of the mouths of the divided vessels follows in opposite directions, it is no less true, that in the course of a few days after the incision, the mouths of the same vessels approximate each other, and inosculate, so as to resume their former continuity. Hence, to derive from this operation all possible advantage, it is essential to extirpate with the knife a small portion of the varicose plexus, together with the adherent particle of the tunica conjunctiva.

To do this operation properly, the plan of passing a needle threaded with silk through the varicose plexus is to be dispensed with. The eye-lids are to be separated from the affected eye by a skilful assistant, who is, at the same moment, to support the patient's head upon his breast. The surgeon is then to take hold of the varicose vessels, with a pair of small forceps, near the edge of the cornea, and to lift them a little up, which the lax state of the conjunctiva renders easy; then, with a pair of small curved scissars, he is to cut away the plexus of varicose vessels, together with a small piece of the conjunctiva, making the wound of a semilunar form, and, as near as possible to the cornea. If it should be necessary to operate upon more than one plexus of varicose vessels, situated at some distance apart, the surgeon must elevate them one after the other with the forceps, and remove them. But when they are very close together, and occupy every side of the eye, he must make an uninterrupted circular incision into the conjunctiva, guiding it closely to the margin of the cornea all round, thus dividing with the conjunctiva, all the varicose vessels.

This being done, he may allow the cut vessels to bleed freely; even promoting the hemorrhage by fomenting the eyelids, until the blood discontinues to flow. Then the eye is to be covered with an oval piece of the emplastrum saponis, and a retentive bandage. The eye ought not to be opened till twenty-four hours after the operation, when, usually, the opacity of the cornea will be found completely dispersed; and, during the ensuing days, the patient is to be enjoined to keep the eye shut, and covered with a bit of fine rag. A collyrium of milk and rose-water warm, may be applied two or three times a day. It is worthy of observation, when the inflammation of the conjunctiva happens, about the second or third day after the operation, particularly in cases in which the incision is made all round, that while the greater part of the sphere of the eye reddens, a whitish circle, in the place of the incision, forms a line of boundary to the redness which does not extend further upon the cornea. This inflammation of the conjunctiva, with the aid of internal antiphlogistic remedies, and topical emollients, abates in a few days, and then pus is secreted along the track of the incision in the conjunctiva. The wound contracts, and growing smaller and smaller, soon cicatrizes. Bathing the eye with warm milk and rose-water is the only local treatment necessary in this state of the complaint.

Thus not only the transparency of the cornea is revived, but also the preternatural laxity of the conjunctiva is diminished, or even removed. When afterwards the conjunctiva appears yellowish and wrinkled, the use of topical astringents and corroborants, and of Janin's ophthalmic ointment, will yet prove highly beneficial, in preventing the recurrence of the varicose state of the vessels. (*Scarpa sulle malattie degli occhi.*)

From some observations, published by Mr. Wardrop, it would appear, that certain opacities of the cornea are produced by an increase in the quantity of the contents of the eyeball, and not by the deposition of an albuminous fluid in the texture of the cornea, as takes place in the common speck. He considers, that this fact is proved by cases, in which the cornea regained its transparency the instant the aqueous humour was evacuated. Some cases are detailed by this gentleman, with a view of recommending the practice of puncturing the cornea, and discharging the aqueous humour, for the relief of the kind of opacity to which we have here alluded. (See *Medico-Chirurgical Trans. Vol.* 4, *p.* 180, *&c.*)

For other opacities of the cornea refer particularly to *Albugo, Leucoma,* and *Staphyloma.*

### ULCER OF THE CORNEA.

This is a common consequence of the bursting of a small abscess, which not unfrequently forms beneath the delicate layer of the conjunctiva continued over the cornea, or in the very substance of the cornea itself, after violent ophthalmy. At other times, the ulcer of the cornea is produced by the contact of corroding matter, or sharp-pointed bodies insinuated into the eyes, such as quick lime, pieces of glass, or iron, thorns, &c. The little abscess of the cornea is attended with the same symptoms, as the severe acute ophthalmy; especially with a troublesome sensation of tension in the eye, eyebrow, and nape of the neck; with ardent heat; copious secretion of tears; aversion to light; intense redness of the conjunctiva, particularly near the point of suppuration. The inflammatory pustule, compared with similar ones, in any other part of the body, is slow in bursting after matter is formed. Experience has nevertheless evinced, that it is improper to puncture the small abscess; for, though it assumes the appearance of being perfectly maturated, the matter contained in it, is so tenacious, and adherent to the substance of the cornea, that not a particle issues out of the artificial aperture, and the wound exasperates the disease, increases the opacity of the cornea, and often occasions another small abscess to form in the vicinity of the first. The safest plan, in this case, is to temporize, until the pustule spontaneously bursts, promoting it by means of frequent fomentations, bathing the eye with warm milk and water, and applying emollient poultices. The spontaneous bursting of the little abscess is usually denoted by a sudden increase of all the symptoms of ophthalmy; particularly by an intolerable burning pain at the point of the cornea, where the abscess first began, greatly increased by motion of the eye, or eyelid. The event is confirmed by ocular inspection, and at the spot where the white pustule existed, a cavity appears, as may best be seen, when the eye is viewed in the profile. Extraneous bodies in the eye, which have simply divided a part of the cornea, or lodged in it, when soon extracted, do not in general cause ulceration, as the injured part heals by the first intention. Those which destroy, or burn the surface of this membrane, or which, when lodged, are not soon extracted, excite acute ophthalmy, suppuration at the injured part, and at length ulceration.

The ulcer of the cornea has this, in common with all solutions of continuity in the skin, where it is delicate, tense, and endowed with exquisite sensibility, that, at its first appearance, it is of a pale ash-colour; has its edges high, and irregular; creates sharp pain; discharges, instead of pus, an acrid serum, and tends to spread widely and deeply. Such is the precise character of ulcers upon the cornea, and such is that of those upon the nipples of the mammæ; the glans penis; lips; apex of the tongue; the tarsi; the entrance of the meatus auditorius externus; nostrils; &c. Ulcers of this description, neglected, or ill-treated, speedily enlarge, make their way deeply, and destroy the parts in which they are situated. If they spread superficially upon the cornea, the transparency of this membrane is destroyed; if they proceed deeply, and penetrate the anterior chamber of the aqueous humour, this fluid escapes, and a fistula of the cornea may ensue; and if it should form a larger opening in it, besides the exit of the aqueous humour, it occasions another more grievous malady than the ulcer itself, namely, a prolapsus of a portion of the iris; an escape of the crystalline lens and vitreous humour, in short, a total destruction of the whole organ of sight. This afflicting accident is not unfrequent, in consequence of acute ophthalmy from gonorrhea, when neither internal nor external means avail, to arrest the progress of ulceration. It is therefore of the highest importance, as soon as an ulcer appears upon the cornea, to impede its growing larger, as much as the nature of it will permit; the morbid process should be converted into a healing one, and the surgeon must exert his skill with more attention, the more extensive and deep the ulceration has proceeded. The cicatrix of a large ulcer impairs the texture of the cornea so much, that the injury is irreparable.

They, who inculcate, that no external application can be adopted with benefit, for the cure of this disease, before the acute ophthalmy has been subdued, or, at least, diminished, are, in Scarpa's opinion, deceived. Experience teaches, that local remedies ought, in the very first instance, to be applied to the ulcer, such as are appropriate to lessen the increased morbid irritability, and stop the destructive process going on; afterwards such means should be taken, as will cure the ophthalmy, if it does not subside gradually, as the ulcer heals. It is a fact, confirmed by repeated observation, that it is the ulcer which keeps up the ophthalmy, not the ophthalmy the ulcer. The case, however, is to be excepted, in which the ulcer makes its appearance in the height of a severe ophthalmy. Here the first indication is to abate inflammation, before attempting to heal the sore.

On opening the little abscess of the cornea, it is true, the symptoms of acute ophthalmy become aggravated; the redness of the conjunctiva is increased, as well as the turgid state of its vessels; but it is equally certain, that it happens from no other cause, than an increased inflammation in the part, in consequence of the augmented sensibility in the ulcerated spot of the cornea. As soon as this increase of sensibility in the ulcer of the cornea ceases, or abates, in violence, the ophthalmy retreats with equal speed, and, finally, when the ulcer heals, the inflammation vanishes gradually, or, at most, requires only the use of an astringent, and corroborant collyrium, for a few days. Analogous examples every day occur in practice, in ulcers of other parts, besides the cornea; particularly in little foul ulcers on the inside of the lips, on the apex of the tongue, on the nipples, on the glans penis, which, as was described above, at their first appearance, assume an ash-coloured surface, excite inflammation of the part in which they are seated, and cause a very troublesome itching and ardent heat in the part affected. To subdue this inflammation, we do nothing more, and the vulgar do the same, than repel the excessive irritability in these ulcers, and convert the ulcerative process into cicatrization. This done, the surrounding inflammation immediately disappears of itself.

The resource of art, productive of such speedy and such good effects, in these cases, is the caustic. It immediately destroys the naked extremities of the nerves in the ulcerated part, and soon removes that diseased irritability prevalent in the part affected; it converts the ash-coloured surface of the ulcer, and the serous discharge upon it, into an eschar and scab, which, as a kind of epidermis, moderates the contact of the neighbouring parts upon the ulcer, and at length converts the process of ulceration into that of granulation and cicatrization.

For cauterizing the ulcer of the cornea, the caustic to which Scarpa gives the preference, is the argentum nitratum. It must be scraped to a point, like a crayon pencil, and the eyelids being opened perfectly, and the upper eyelid suspended, by means of Pellier's elevator, the ulcer of the cornea is to be touched with the apex sufficiently to form an eschar. Should any of the caustic dissolve in the tears, the eye must be copiously bathed with warm milk. At the instant the caustic is applied, the patient complains of a most acute pain; but this aggravation is amply compensated, by the ease experienced a few minutes after the operation: the burning heat in the eye ceases, as it were by a charm; the eye and eyelids become capable of motion without pain; the flux of tears and the turgidity of the vessels of the conjunctiva decrease; the patient can bear a moderate light, and enjoys repose. These advantages last while the eschar adheres to the cornea.

On the separation of the eschar sometimes at the end of two, three, or four days after the application of the caustic, the primary symptoms of the disease recur, especially the smarting and burning pain at the ulcerated part of the cornea; the effusion of tears; the restraint in moving the eye and eyelids; and the aversion to light; but all these inconveniences are less in degree than before. At their recurrence, the surgeon, without delay, must renew the application of the argentum nitratum, making a good eschar, as at first, upon the whole surface of the ulcer, which will, as before, be followed by perfect ease in the eye. The application of the caustic is, if required, to be repeated a third time, that is, if upon the separation of the eschar, the extreme irritability in the ulcer is not exhausted, and its progressive mischief checked. When the case goes on favourably, it is a constant phenomenon in the cure of this disease, that, at every separation of the eschar, the diseased sensibility of the eye is decreased, the ulcer also, abandoning its pale ash-colour, assumes a delicate fleshy tint, a certain sign that the destructive process which prevailed, is turned into a healing one. The turgid state of the vessels of the conjunctiva, and the degree of ophthalmy, disappears, in proportion as the ulcer draws near to a cure. At this epoch, when the formation of granulations has begun, the surgeon would act very wrongly, did he continue longer the use of the argentum nitratum; it would now reproduce pain, effusion of tears, and inflammation in the eye; and the ulcer would take on that foul ash-coloured aspect, with swelled and irregular edges, which it had in the beginning. Platner has noticed this fact. *Necesse est, ut hoc temperatâ manu, nec crebrius fiat, ne nova inflammatio, novaque lachryma hic acrioribus concitetur. Inst. Chirurg.* § 314. As soon as ease is felt in the eye, and granulations begin to rise, whether after the first, second, or third application of the caustic, the surgeon must refrain from the use of every strong caustic, and use no other application than the vitriolic collyrium. ℞ *Zinci Vitriol gr.* iv. *in Aq. Rosæ* ℥iv *cum* ℥ss *mucil. Sem. Cydon, mali M.* To be used every two hours, defending the eye, in the intervals, from the contact of the air and light, by means of a slight compress, and retentive bandage. In cases in which, besides the ulcer of the cornea, a slight relaxation of the conjunctiva remains, Janin's ointment, towards the end of the treatment, introduced between the eye and eyelids, morning and evening, proves extremely serviceable. It must be adapted in strength and quantity to the particular sensibility of the patient.

To cure those superficial excoriations of the cornea, which make no incavation in the substance of this membrane, and which, in reality, are only a detachment of the cuticle, covering the layer of the conjunctiva continued over the cornea, the use of caustic is not requisite. The above vitriolic collyrium, combined with the mucilage, is sufficient. The symptoms which accompany such slight excoriations, or detachments of the cuticle, are unimportant, and when the patient takes care to bathe his eye, every two or three hours, with the solution of vitriol, and to avoid too much light, and the impression of the atmosphere, they soon get well.

Thus far of the ulcer of the cornea, and the best mode of curing it in ordinary cases. However, sometimes, in consequence of ill-treatment, the ulcer, already very extensive, assumes the form of a fungous excrescence upon the cornea, appearing to derive its nourishment from a band of blood-vessels of the conjunctiva; and, on this account, it occasions, not unfrequently, a serious mistake in being taken for a real pterygium. Left to itself, or treated with slight astringents, it produces, in general, a loss of the whole eye. It requires the speedy adoption of some active and efficacious plan, to destroy all the fungus upon the cornea, to annihilate the vessels of the conjunctiva tending to it, and to impede the progress of ulceration. This consists first in cutting away the fungus, with a pair of small scissars, to a level with the cornea, continuing the incision far enough upon the conjunctiva, to remove, with the excrescence, that string of blood-vessels, from which it seems to derive its supply. Having effected this, and allowed the blood to flow freely, it is proper to apply the argentum nitratum to all the space of the cornea, which appears to have been the seat of the fungus, so as to make a complete eschar; and if, upon its separation, the whole morbid surface should not be destroyed, the caustic must be repeated, until the ulcerative process changes into a healing one. To execute commodiously such a full application of the caustic, it is not in general enough to have the upper eye-lid raised by an assistant, and the lower one depressed; it is also further requisite, that the operator, by means of a spatula, introduced between the upper eye-lid and the eye-ball, should hold the same elevated with his own left hand, while, with the right, he applies the caustic, so as to form a strong deep eschar.

It must be acknowledged, the action of the caustic cannot always be calculated with precision, and therefore a portion of the whole thickness of the cornea may be destroyed with the fungus, which never fails to be followed by a prolapsus of part of the iris, through the aperture made in the cornea. This accident may seem to some very grievous; it is, however, not irreparable, as will be shewn in the article *Iris, Prolapsus of*; and when the surgeon can produce a firm cicatrix at the point, where the excrescence was situated, which resists a reproduction of the fungus, and a total destruction of the eye, he has fulfilled the indications required. (*Scarpa sulle Malattie degli Occhi.*)

In a late publication, two cases of ulcer of the cornea are recorded, which were benefited by Mr. Wardrop's operation of puncturing the cornea and discharging the aqueous humor. In the first example, there was an ulcer on the central part of the cornea, and a cluster of blood-vessels passing towards it. The whole eye-ball was also much inflamed. The puncture was made at the place where the vessels passed. The patient's severe headach was relieved, and under the use of fomentations, and the vinous tincture of opium, all the other symptoms rapidly subsided. In the second case, there were two or three erosions, with a good deal of muddiness of the cornea, headach, &c. The obscurity of this membrane instantly disappeared, and the headach subsided, upon the aqueous humor being discharged. With the help of bleeding and fomentations, the symptoms abated, the ulcer healed in a few days, and the eye recovered. (See *Medico-Chir. Trans. Vol.* 4, *p.* 186—187.)

### OSSIFICATION OF THE CORNEA.

Mr. Wardrop has seen only one instance of ossification of the cornea; and, in that case, the whole eye was changed in its form, and the cornea had become opaque. On macerating the latter part, a piece of bone, weighing two grains, oval shaped, hard, and with a smooth surface, was found between its lamellæ. A piece of bone was also found between the choroid coat and retina of the same eye.

The same gentleman informs us, that Walter had, in his museum, a piece of cornea, taken from a man sixty years of age, and containing a bony mass, which was three lines long, two broad, and weighed two grains.

In Mr. Wardrop's publication, there is also recorded a curious case, in which a portion of bone was formed, either in the substance of the cornea, or immediately behind it, and which was extracted from the eye by Mr. Anderson, surgeon at Inverary. The patient was a woman thirty-one years of age, and the formation of the bony substance, which was about half as large as a sixpence, is said to have been occasioned by a fall against the root of a tree, fifteen years before the operation, by which accident the eye was struck, though not cut. (See *Wardrop's Essays on the Morbid Anatomy of the Human Eye*, *Chap.* 10.)

### ALTERATION IN THE FORM OF THE CORNEA.

This is the last subject which I shall take notice of in the present article. It is well known, that the convexity of the cornea varies in different persons, and in the same individual at different periods of life, this part of the eye being naturally most convex in young subjects. It appears, also, from the experiments of the late Mr. Ramsden, and those of Mr. Home, that the sphericity of the cornea is altered according to the distance, at which objects are viewed.

Sometimes the cornea projects, or collapses, so considerably, without its transparency being affected, that sight is much impaired, or quite destroyed. The first case has been called by some authors, the *Staphyloma pellucidum*; the second *Rhytidosis.*

Leveillé, the French translator of Scarpa's book on the diseases of the eye, has described a case, in which the cornea of both eyes became of a conical form. Mr. Wardrop has met with two examples of a similar disease; but only one eye was affected in each of them. In both cases, the conical figure of the cornea was very remarkable, and the apex of the cone was in the centre of the cornea. When the eye was viewed laterally, the apex resembled a piece of solid crystal, and when looked at directly opposite, it had a transparent sparkling appearance, which prevented the pupil and iris from being distinctly seen.

One of these cases occurred in a lady upwards of thirty years of age, and the changes produced in her vision, were very remarkable. At the distance of an inch, or an inch and a half, she could plainly distinguish small objects, when held towards the temporal angle of the eye, although it required considerable exertion; but, the sphere of vision was very limited.

On looking through a small hole in a card, she could distinguish objects held very close to the eye, and could even read a book.

At any distance greater, than two inches, vision was very indistinct, and, at a few feet, she could neither judge of the distance, nor the form of the object.

When she looked at a distant luminous body, such as a candle, it was multiplied five or six times, and all the images were more or less indistinct. She could never find any glass sufficiently concave to assist her vision. She did not remark this complaint in her eye, until she was about sixteen years of age, and she does not think, it has undergone any change since that time.

In Mr. Wardrop's publication may be read a letter from Dr. Brewster, giving an explanation of the phenomena of the foregoing case.

It appears, that Mr. Phipps has had opportunities of watching the progress of several cases, in which the cornea had become conical, and that he never saw the disease in persons under the age of fourteen, or sixteen. The same gentleman also observes, that when the cone is once complete, the disease seldom makes any further progress, except that the apex sometimes becomes opaque.

Burgman saw a remarkable case, where the cornea of both the eyes of a person, who had been hanged, were so prodigiously extended, that they reached down to the mouth, like two horns. (*Haller, Disputationes Chirurg. Tom.* 2.) The chapter by Mr. Wardrop on the preceding subject will be found highly interesting to such as are desirous of further information concerning this curious disease of the eye. (See *Wardrop's Essays on the Morbid Anatomy of the Eye, Chap.* 13.)

**CORNS.** (*Clavi, Spinæ Pedum, Calli,* *Condylomata, &c.*) A corn, technically called *clavus*, from its fancied resemblance to the head of a nail, is a brawn-like hardness of the skin, with a kind of root sometimes extending deeply into the subjacent cellular substance. When this is the case, the indurated part is fixed; but while the hardness is more superficial, it is quite moveable. Some corns rise up above the level of the skin, in the manner of a flat wart. They are hard, dry, and insensible, just like the thickened cuticle, which forms on the soles of the feet, or on the hands of labouring people.

Corns are entirely owing to repeated and long-continued pressure. Hence, they are most frequent in such situations as are most exposed to pressure, and where the skin is near bones, as on the toes, soles of the feet, &c. However, corns have occasionally been seen over the crista of the ilium, from the pressure of stays, and even on the ears, from the pressure of heavy ear-rings.

Corns of the feet are usually owing to wearing tight shoes, and, consequently, they are more common in the higher classes, and in women, than other subjects. In females, indeed, the ridiculous fashion of wearing high-heeled shoes, was very conducive to this affliction; for, certainly, it merits the appellation. In shoes thus made, the whole weight of the body falls principally on the toes, which become quite wedged, and dreadfully compressed in the end of the shoe.

Though some persons, who have corns, suffer very little, others occasionally endure such torture from them, that they are quite incapable of standing or walking. Doubtless the great pain proceeds from the irritation of the hard corn on the tender cutis beneath, which is frequently very much inflamed, in consequence of the pressure. It is observed, that every thing which accelerates the motion of the blood, which heats the feet, which increases the pressure of the corn on the subjacent parts, or the determination of blood to the feet, or which promotes its accumulation in them, exasperates the pain. Hence, the bad effects of warm stockings, tight shoes, exercise, long standing, drinking, &c. The pain in warm weather is always much more annoying than in winter.

If a person merely seeks temporary relief, it may be obtained by pulling off his tight shoes, sitting down, placing his feet in a horizontal posture, and becoming a little cool; the prominent portion of the corn should be cut off, as far as it can be done, without exciting pain, or bleeding, and the feet should be bathed in warm water.

The radical cure essentially requires the avoidance of all the above causes, and, particularly, of much walking, or standing. Wide, soft shoes, should be worn. Such means are not only requisite for a radical cure, but they alone very often effect it. How many women become spontaneously free from corns in child-bed, and other confinements? Though the radical cure is so easy, few obtain it, because their perseverance ceases as soon as they experience the wished-for relief.

When business, or other circumstances, prevent the patient from adopting this plan, and oblige him to walk or stand a good deal, still, it is possible to remove all pressure from the corn. For this purpose from 8 to 12 pieces of linen, smeared with an emollient ointment, and having an aperture cut in the middle, exactly adapted to the size of the corn, are to be laid over each other, and so applied to the foot, that the corn is to lie in the opening, in such a manner, that it cannot be touched by the shoe, or stocking. When the plaster has been applied some weeks, the corn commonly disappears, without any other means. Should the corn be in the sole of the foot, it is only necessary to put in the shoe a felt sole, wherein a hole has been cut, corresponding to the situation, size, and figure, of the induration.

A corn may also be certainly, permanently, and speedily eradicated, by the following method, especially when the plaster, and felt-sole with a hole in it, are employed at the same time. The corn is to be rubbed twice a day with an emollient ointment, such as that of marshmallows; or with the volatile liniment, which is still better; and in the interim, is to be covered with a softening plaster. Every morning and evening, the foot is to be put for half an hour in warm water, and, whilst there, the corn is to be well rubbed with soap. Afterwards, all the soft, white, pulpy outside of the corn, is to be scraped off with a blunt knife; but, the scraping is to be left off, the moment the patient begins to complain of pain from it. The same treatment is to be persisted in, without interruption, until the corn is totally extirpated, which is generally effected in eight or twelve days. If left off sooner, the corn grows again.

A multitude of other remedies for curing corns are recommended. They all possess, more or less, an emollient and discutient property. The principal are green wax, soap, mercurial, and hemlock plasters, a piece of green oil-skin, &c. They are to be applied to the corn, and renewed as often as necessary. An infallible composition consists of two ounces of gum ammoniacum, the same quantity of yellow wax, and six drams of verdigrease. In a fortnight, if the corn yet remain, a fresh plaster is to be applied.

It is frequently difficult, and hazardous to cut out a corn. The whole must be completely taken away, or else it grows again; and the more frequently it is partially cut away, the quicker is its growth rendered. When the skin is moveable, and, consequently, the corn not adherent to the subjacent parts, its excision may be performed with facility and safety, but, not without pain. But, in the opposite case, either leaving a piece of the corn behind, or wounding the parts beneath, can seldom be avoided. The latter circumstance may excite serious mischief.

A person, entirely cured of corns, is sure to be affected with them again, unless the above mentioned causes be carefully avoided. Some subjects are, indeed, particularly disposed to have the complaint. There are persons, who for life wear tight shoes, and take no care of their feet, and, yet, are never incommoded with corns. On the contrary, others are constantly troubled with them, though they pay attention to themselves. Many are for a time vexed with corns, and then become quite free from them, though they continue to wear the same kind of shoes and stockings.

Mr. Wardrop recommends cutting, or tearing away, as much of the corn as can be done with safety; then keeping the toe for some time in warm water; and, after the adjacent skin has been well dried, rubbing the exposed surface of the corn with the argentum nitratum, or wetting it, by means of a camel-hair pencil, with a solution of the muriate of mercury in spirit of wine. Either of these applications, two or three times repeated, he says, will mostly effect a cure. (See *Medico-Chirurg. Trans. Vol.* 5, *p.* 140.) This gentleman, however, does not seem to be aware, that the use of caustic for the cure of corns is not at all a new proposal. (See *Callisen's Syst. Chir. Hodiernæ, Part* 2. 200.)

The above account is chiefly taken from *Richter's Anfangsgrunde der Wundarzneykunst, Band* 1.

**COUCHING.** The depression of the cataract, or the introducing of an instrument into the eye, for the purpose of pressing the opaque crystalline lens downward, out of the axis of sight. (See *Cataract.*)

**COUVRE-CHEF.** The name of some bandages. See *Bandage.*

**CRANIUM.** For an account of its fractures, see *Head, Injuries of.*

**CREMOR LITHARGYRI ACETATI.**

℞ Cremoris lactis ℥j.
Aq. litharg. acet. ʒj. M.

Employed by Kirkland in ophthalmies, and other inflammations.

**CREPITATION.** This term is often applied to the crackling noise, made in cases of emphysema, when the air is passing from one part of the cellular membrane into another.

**CREPITUS.** (from *crepo*, to make a noise.) This term is applied by surgeons to the grating sensation, occasioned by the ends of a fracture, when they are moved, and rubbed against each other. A crepitus is one of the most positive symptoms of the existence of such an accident.

**CUPRUM VITRIOLATUM** (*Sulphate of Copper*) is an escharotic, and an ingredient in several astringent fluid applications, lotions for ulcers, collyria for the eyes, and injections for the urethra.

**CURVATURE OF THE SPINE.** See *Vertebræ, Disease of.*

**CYSTITOME.** (from ϰυστις, and τεμνω, to cut.) An instrument made on the same principle as the pharyngotomus, and intended to open the capsule of the crystalline lens. This name should more properly be applied to an instrument for cutting the bladder; but, *M. de la Faye*, who invented the cystitome, has rather ungrammatically chosen its name, and it will now probably continue for ever as it is. The sheath of the instrument conceals a little lancet, which is capable of darting out to the distance of one, two, or three lines, by means of a small spring, contained in the body of the instrument. In describing the modern plan of extracting the cataract, we have mentioned, that a gold needle is recommended by Baron Wenzel and Mr. Ware for puncturing the capsule of the crystalline lens. The cystitome is certainly not a bad instrument, and it might still be useful, in cases, in which the iris is very irritable, and disposed to contract in an unusual degree. It is now, however, never employed. (See *Encyclopédie Méthodique, Partie Chirurg.*)

**CYSTOCELE.** (from ϰυστις, the bladder, and ϰηλη, a tumour.) A hernia, formed by a protrusion of the bladder. (See *Hernia.*)

**CYSTOTOMIA.** (from ϰυστις, the bladder, and τεμνω, to cut.) Making an opening into the bladder, for the extraction of a stone or calculus. (See *Lithotomy.*)

**CUPPING.** (See *Bleeding.*)

**CURETTE.** (French.) A very small instrument, shaped like a spoon, or scoop, and used by operators, who extract the cataract, for taking away any opaque matter, which may remain behind the pupil, immediately after the crystalline has been taken out.

# D.

**DACRYOMA.** (from δακρυω, to weep.) An impervious state of one, or both the puncta lachrymalia, causing an effusion of tears.

**DAUCUS.** The carrot is used in surgery for making a poultice, which is often applied to malignant and spreading ulcers. (See *Cataplasma Dauci.*)

**DECOCTUM CHAMŒMELI.** ℞. Florum Chamœmeli ℥ss. Aquæ Distillatæ lbj. Boil ten minutes, and strain the liquor. This answers very well as a common fomentation. (See *Fomentum.*)

**DECOCTUM DULCAMARÆ.** ℞. Dulcamaræ Caulis Concisæ unciam, Aquæ Octarium cum Semisse. Decoque ad octarium, et cola.

The decoction of bittersweet is recommended for some cutaneous diseases, proceeding from scrofula, lepra, and lues venerea.

**DECOCTUM HELLEBORI ALBI.** (Now the *Decoctum Veratri.*) ℞. Pulveris Radicis Hellebori Albi ℥j. Aquæ Distillatæ lbij. Spiritus Vinosi Rectificati ℥ij. Boil the water and powder, till only half the fluid remains, and, when cold, add the spirit.

This is used as a lotion for curing the itch, tinea capitis, and some herpetic affections.

**DECOCTUM LOBELIÆ.** (*Blue Cardinal Flower of Virginia.*) ℞. Radicis Lobeliæ Syphiliticæ Siccæ Manip j. Aquæ Distillatæ lb. xii. This is to be boiled till only four quarts remain. The lobelia once gained repute as an antivenereal, though little reliance is now put in it. The patient is at first to take half a pint twice, and afterwards four times a day. It operates, however, as a purgative, and the doses must be regulated according as the bowels appear to bear them.

**DECOCTUM MEZEREI.** ℞ Corticis Radicis Mezerei Recentis ʒij. Radicis Glycirrhizæ Contusæ ℥j. Aquæ Distillatæ lbiij. Boil the mezereon in the water, till only two pints remain; and, when the boiling is nearly finished, add the liquorice root.

The decoction of mezereon has been much prescribed for venereal nodes and nocturnal pains, in doses of from four to eight ounces, three times a day.

**DECOCTUM PAPAVERIS.** ℞ Papaveris Somniferi Capsularum Concisarum ℥ij. Aquæ lbiv. Boil for a quarter of an hour, and strain.

This decoction is used as a fomenting fluid in cases attended with great pain and inflammation.

**DECOCTUM QUERCUS.** ℞ Quercûs Corticis ℥j. Aquæ lbij. Boil down to a pint, and strain the fluid.

This decoction forms a very astringent injection, which is sometimes used for stopping gleets from the vagina. It also makes a lotion, which is of considerable use in cases of prolapsus ani. It may be applied to some slight rheumatic white swellings, which it will sometimes cure, particularly, when a little alum is put into it.

**DECOCTUM SARSAPARILLÆ.** ℞ Sarsaparillæ Radicis Concisæ ℥iv. Aquæ Ferventis lbiv. The sarsaparilla is to be macerated for four hours, near the fire, in a vessel lightly closed. The root is then to be taken out, bruised, and put into the fluid again. The maceration is to be continued two hours longer, after which the liquor is to be boiled till only two pints remain. Lastly it is to be strained.

**DECOCTUM SARSAPARILLÆ COMPOSITUM.** ℞ Decocti Sarsaparillæ ferventis lbiv. Sassafras Radici Concisæ, Guaiaci Ligni Rasi, Glycyrrhizæ Radicis Contusæ, Singulorum ℥j. Mezerei Radicis Corticis ℥iij.

These are to be boiled together for a quarter of an hour, and then strained.

This, and the preceding decoction of sarsaparilla, are much prescribed by surgeons in cases of venereal nodes and pains; but, while some surgeons hold these medicines in high repute, in such cases, others entertain an opposite opinion of them. It is common, also, to exhibit these decoctions in several cutaneous diseases, and in scrofula.

The simple decoction is frequently directed for the restoration of the constitution after a course of mercury, being often given mixed with an equal quantity of milk.

The common dose of both the decoctions is from four to eight ounces, three times a day.

The compound one possesses similar qualities to those of the famous Lisbon Diet Drink, and is now generally prescribed instead of it.

**DECOCTUM ULMI.** ℞ Ulmi Corticis Recentis Contus. ℥iv. Aquæ lbiv. Boil to two pints, and then strain the liquor.

The decoction of elm bark is commonly prescribed in some herpetic diseases of the skin. Its operation is frequently promoted by giving with it the hydrargyri submurias.

**DECOCTUM VERATRI.** See *Decoctum Hellebori Albi.*

**DENTISCA'LPIUM.** An instrument for scraping the tartareous matter off the teeth. Oribasius denotes by this word an instrument for separating the gums from the teeth.

**DEPRESSION.** (from *deprimo*, to press down.) This word in surgery means the sinking inwards of some part of the skull, in consequence of external violence. In this manner pressure is often made on the brain, and, hence, it frequently becomes necessary to raise the depressed portion of bone with an elevator, or to take it away altogether, with a trephine, or one of Mr. Hey's saws. (See *Head, Injuries of.*)

**DEPRESSION OF THE CATARACT.** The operation of couching, or removing the opaque crystalline lens out of the axis of vision, by pressing it downward into the vitreous humour with a particular kind of needle. (See *Cataract.*)

**DERIVATION.** A term often met with in old medical and surgical books, and in some modern ones. It means the attraction of humours from one place to another, where they are discharged. Thus when a blister was put on the nape of the neck for the relief of a disease of the eye, the modus operandi was explained on the principle of derivation. In all the best schools, the old doctrine of derivation is now exploded. Counter-irritation is the principle, on which the moderns commonly explain what the old writers used to refer to *derivation.*

**DETERGENTS.** Medicines fancied to have the quality of cleansing wounds. The conversion of a foul sore to one of clean appearance is effected by the action of the blood-vessels and absorbents of the ulcerated surface, and, if any application deserve the appellation of a detergent, it is only because it excites this salutary action.

**DETERMINATION.** When the blood flows into one part more rapidly and copiously, than it does into others, or than is natural, it is said, in the language of surgery, that there is a *determination* of blood to such part.

**DIÆRESIS.** (from διαιρεω, to divide.) A division of substance; a solution of continuity. This was formerly a sort of generic term, applied to every part of surgery, by which the continuity of parts was divided.

**DIAGNOSIS.** (from διαγνωσκω, to distinguish.) The discrimination, or forming a judgment of a disease, from its symptoms.

**DIGESTION.** (from *digero*, to dissolve.) By the *digestion* of a wound, or ulcer, the old surgeons meant bringing it into a state, in which it formed healthy pus.

**DIGESTIVES.** Applications, which promote this object.

**DIORTHROSIS.** (from διορθροω, to direct.) One of the ancient divisions of surgery: it signifies the restoration of parts to their proper situations.

**DIPLO'PIA.** (*Visus duplicatus*) This is one of the most unusual diseases of the eyes, and it is of two kinds. For instance, the patient either sees an object double, treble, &c. only when he is looking at it with both his eyes, and, no sooner is one eye shut, than the object is seen single and right; or, else, he sees every object double, whether he surveys it with one, or both his eyes. The disorder is observed to affect persons in different degrees. Patients seldom see the two appearances, which objects present with equal distinctness; but, generally, discern one much more plainly and perfectly, than the other. The first distinct shape, which strikes the eye, is commonly that of the real object, while the second is indistinct, false, and visionary. Therefore, patients, labouring under this affection, seldom make a mistake, but, almost always know which is the true and real object. However, there are cases, in which the patient sees the two appearances, which things assume, with equal clearness, so that he is incapable of distinguishing the real object from that, which is false and only imaginary.

The disorder is sometimes transitory and of short duration, and may be brought on in a healthy eye by some accidental cause, which is generally an irritation affecting the organ. Sometimes, the complaint is continual; sometimes periodical. In particular instances, the patient only sees objects double, when he has been straining his sight for a considerable time, as, for example, when he has been reading a small print for a long while by candlelight. In this case, the disorder becomes lessened by shutting the eyes for a few moments. There are also instances, in which the objects only have a double appearance at a particular distance, and not, either when they are nearer, or further off. Sometimes, the patient sees objects double only upon one side; as, for example, when he turns his eyes to the right hand, while nothing of this sort is experienced in looking in any other direction. In certain cases, objects appear double, let the eyes be turned and directed in any way whatsoever.

The causes of double vision may be divided into four classes. Namely, the object, which the patient looks at, may be represented double upon the retina, which is the effect of the first class of causes. Or, the object may be depicted in one eye differently from what it is in the other, in regard to size, position, distance, clearness, &c.; this is the effect of the second class of causes. Or, the object may appear to one eye to be in a different place from that which it seems to the other to occupy: the effect of the third class of causes. Or, lastly, the sensibility of the optic nerves is defective, so that the image of an object, though it may appear single to one eye as well as the other, yet, in one identical situation will seem double to both of them. When the complaint originates from causes of the first and fourth class, the patient sees things double, whether he is using only one, or both eyes; but, when it proceeds from the second and third class of causes, the patient only sees objects double, when he is looking at them with both eyes, and, no sooner does he shut one, than objects put on their natural, single appearance.

The following are the chief causes of the first class of a single object being depicted upon the retina as if double. 1. An unevenness of the cornea, which is divided into two, or more convex surfaces. There are cases, which shew, that such an uneven shape may actually be the cause of double vision. (*Haller, Element. Physiol. Tom. 5, p.* 85.) However, it must not be dissembled, that there is a far greater number of instances, in which such unevenness of the cornea, though equally considerable, does not occasion this defect of sight. We have principally an opportunity of observing cases of this sort after the operation of extracting the cataract. From these circumstances, it would seem, that the inequalities must be of a very particular shape to produce double vision. The diagnosis of this cause is easy enough; but, the removal of it is impracticable; for, how is it possible to restore the original shape of the cornea? 2. An inequality of the anterior surface of the crystalline lens, whereby the same is divided into several distinct surfaces, it is suggested, may also be the occasion of diplopia. Such an inequality may possibly produce the disorder; but, it is exceedingly doubtful, whether any case of this sort has ever been met with, and, as Richter properly remarks, the investigation is not worth undertaking, as the diagnosis and cure would be equally impracticable. The only possible method of cure would be the extraction, or depression, of the crystalline lens; yet, with the uncertainty respecting the nature of the cause, what man would be justified in performing an operation, in which the patient is not wholly exempt from the danger of losing his sight altogether? A double aperture in the iris, or, as the case is termed, a double pupil, has been enumerated as a cause of diplopia. However, as Richter observes, the reality of such a cause is doubtful, for, cases have been noticed, where double vision was not the effect of there being two openings in the iris. (*Janin Mém. sur l'Oeil.*) But, were the disorder actually to originate in this way, it would not admit of a cure.

The causes of the second class, by the effect of which the object is represented, in regard to its size, position, distance, &c. differently in one eye from what it is in the other, are for the most part rather possible, than such as have been actually observed. The causes, which make objects assume an appearance contrary to the real one, may sometimes be confined to one eye, to which things are depicted diversely from what they are to the other healthy eye, so that the patient sees, as it were, double. Thus, for example, there may be a stronger refraction of the rays of light in one eye, than the other; the patient may be a *myops* with one eye, and a *presbyops* with the other; and then the object will seem to one eye large, to the other small; to one eye distant, to the other plainly near. This state of the sight, indeed, is said to have occurred after operating upon a cataract in one eye. (*Heuermann.*) However, that this is not a common consequence of operating upon a cataract in one eye, while the other is perfect, seems to be clearly evinced by several cases in Wenzel's treatise on the cataract, by some facts, which are related both by St. Yves and Maître-Jean, and by some observations, published in the Medical and Physical Journal, for May 1808. In consequence of a certain defect of the sight, objects, which are perpendicular, seem to the patient to have a sloping posture. When it is considered, that only one eye is thus affected, and that to this things will appear sloping, and to the other healthy one straight, double vision must be the effect. A few remarks connected with this subject will be introduced hereafter. (See *Sight, Defects of.*)

When both eyes are so directed to an object, that it becomes situated in the axis of vision of each of these organs, such object is represented in both at the same place, that is, it is depicted upon that part of the retina, on which the axis of sight falls. Thus, the object seems to both eyes to be in the same place, and, though the two organs discern the thing, it only communicates a single appearance. But, when one eye is turned to any object in a different direction from that of the other; that is to say, when one eye is turned to an object in such a way, that the object is situated in the axis of vision of this eye, while the opposite eye is so turned, that the said object is placed on one side of its axis vision; in other words, when a person squints; the object is depicted in one eye upon a different part of the retina from what it is in the other; consequently, the object appears to the two respective organs to be differently situated, and the patient is affected with diplopia. This is the third species of this disorder, which arises from strabismus as a third kind of occasional cause. Such patients naturally only see objects double, when they behold them with both eyes.

A person, who squints, usually has one eye stronger than the other, and the weakness of one of these organs is the common cause of the strabismus. Such a person does not see objects double, because he only sees with one eye well, and with the other so faintly and imperfectly, that scarcely any impression is made. Hence, every case of strabismus is not necessarily combined with diplopia; indeed, the common kind of squinting is not joined with it. A person, affected with strabismus, only sees double, when the sight of each eye is equally strong, and when the squinting does not depend upon any weakness of one of the eyes, but, upon some other occasional causes. The principal causes of the latter sort are of a spasmodic nature: viz. an irritation affects some muscle of the eye in such a manner, that the patient is incapacitated from moving both his eyes according to his will, and from directing them to any object, so that such object may be at once the axis of vision of both. Richter states, that, in the majority of cases, the irritation alluded to is seated in the gastric organs, though he thinks, that any other species of irritation may operate upon the eyes in a similar manner. This kind of diplopia is frequently attendant on other spasmodic diseases as a symptom. It often accompanies hypochondriasis. Sometimes, it is the consequence of violent pain. Richter informs us of a man, who saw double and squinted, during a severe headach. He states, that another was affected in the same way during a toothach. Sometimes, the diplopia is owing to a paralysis of one of the muscles of the eye; sometimes, to a tumour in the orbit. The diagnosis of this kind of diplopia is free from difficulty; the patient has been affected with squinting, ever since things have appeared double to him.

The fourth class of causes are such irritations as act upon the optic nerves, changing their sensibility in such a way, that objects do not make that sort of impression upon them, which they ought to do. Thus the patient sometimes sees things having the appearance of being coloured, when they are really not so; immoveable objects seem to him in motion; straight objects appear oblique, and in the cases, which we are now treating of, single things seem to the eye to be double, treble, &c. This faulty kind of sensibility may also be produced by irritation in eyes, which are perfectly sound; but, it is most readily occasioned in eyes, which are preternaturally weak and irritable. In these, very trivial and inconsiderable irritations will often excite it. In the treatment, the common indication is to discover and remove whatever irritation conduces to this effect; but, the attempt frequently fails. In very irritable eyes, the disorder is often brought on by very slight irritations, which cannot always be diminished, or removed. Here, the grand indication is to cure the weakness and irritability of the organs.

The fourth class of causes of diplopia are the principal and most frequent. The irritations giving rise to them, are of various kinds, and generally seated in the abdominal viscera. Diplopia is sometimes the consequence of inebriety, foulness of the stomach, intermitting fevers, hypochondriasis, worms, &c. However, the complaint is occasionally excited by other sorts of irritation. It has frequently followed a violent fright. It may be connected with spasmodic and painful diseases of several kinds. Severe headachs and toothachs are sometimes joined with this affection of the sight. Richter mentions a boy, who, being in the woods, was struck by the bough of a tree over the eye, and, in consequence of the accident, became affected with diplopia. He informs us of a man, who rode a journey on horseback along a snowy road on a very sunshiny day, and was affected in the same manner. I cannot believe with this author, however, that stoppages of purgings and perspirations, and the driving inward of eruptions, have ever really been the cause of diplopia. This affection of the eyes is sometimes the effect of injuries of the head. Persons, who have weak eyes are apt to become double-sighted, whenever they attentively look for a long while at any light shining objects. Patients in fevers are also sometimes double-sighted.

The irritation, which is productive of diplopia, may lead to other serious complaints of the eye, when it operates with great violence. Indeed, it frequently happens, that diplopia terminates in some other disorder of the eyes, and it is often the forerunner of the worst diseases of these organs, particularly, the gutta serena. The difficulty, or ease of the cure partly depends upon the nature of the remote cause, and partly upon the condition of the eye. Some of the causes are easy, others difficult, of removal. When the eye is very weak and irritable, the disorder frequently continues, notwithstanding the irritation has been removed. Also, when the complaint is relieved, it is exceedingly difficult to prevent a relapse, for on very irritable eyes, slight irritations, which cannot be hindered, are apt to produce a return of the affection. Therefore, the indication is to remove the existing defect of sight, and take means for the prevention of its return, or the commencement of any other. The weakness and preternatural irritability of the eye should be removed, as well as every sort of irritation, things which are often very difficult of accomplishment.

The chief business of the surgeon, in

the treatment of this kind of diplopia, consists in endeavouring to find out and remove the irritation occasioning the disorder. The majority of such irritations are of the same nature as those, which give rise to the gutta serena. (See *Amaurosis.*) Indeed, both the complaints are often only different effects of the same cause, and of course require a similar mode of treatment. The boy, whom Richter has mentioned, as having become double-sighted in consequence of being struck over the eye with the bough of a tree, was cured by the external use of the infusum radicis valerianæ and spiritus vini crocatus, with which the eyelids and adjacent parts were rubbed several times a day. A diplopia, which followed a violent fright, has been cured by valerian, preceded by a few doses of cream of tartar. An hypochondriacal patient got rid of the disorder by means of the warm bath. A diplopia, which was supposed to arise from some disorder of the bile, was cured by means of pills made of gum galbanum, guaiacum, rhubarb, and Venice soap, assisted with emetics and purgatives.

When the irritation, exciting the disorder, is only of temporary duration, as, for instance, looking at shining objects; when the disorder continues after the removal of the irritation; or, lastly, when the irritation cannot be well detected; the surgeon is to endeavour, by means of nervous and soothing medicines, either to remove the impression, which the irritation has left upon the nerves; or to render the nerves insensible to the continuing irritation. Experience is loudly in favour of the following remedies for cases of diplopia: hartshorn, dropped in the hand, and held before the eyes open; the external use of the spiritus vini crocatus; warm bathing of the eye, particularly, in a decoction of white poppy heads; bathing the eye in cold collyria; the internal administration of bark, valerian, small doses of ipecacuanha, flowers of zinc, and oleum cajeput. In one instance, in which it was impossible to detect the cause, Richter states, that soluble tartar, with oxe's gall and castoreum was found of service; that, in another similar case, rhubarb, oxe's gall, and assa fœtida; and, in a third, aqua ammoniæ acetatæ with oxe's gall, proved useful. This author further observes, that, in all cases, in which the particular cause of the disorder cannot be precisely determined, we may always conjecture, that such cause has its seat in the abdominal viscera; and that much benefit may often be derived from mild resolvents, evacuants, and anodyne medicines. (*Richter's Anfangsgrunde der Wundarzneykunst. Band 3. Kap. 15.*)

**DIRECTOR.** (from *dirigo*, to direct.) One of the most common instruments of surgery; it is long, narrow, grooved, and made of silver, in order that it may be bent into any desirable shape. Its use is to direct the knife, and protect the parts underneath from the edge or point of the latter instrument. The surgeon introduces the director under the parts, which he means to divide, and then either cuts down, along the groove of the instrument, with a common bistoury, or cuts upward with a narrow, curved, pointed bistoury, the point of which is turned upwards, which he carefully introduces along the groove of the director. This instrument and the crooked bistoury are commonly employed for opening sinuses, for cutting fistulæ in ano, and in other situations, and, for dilating the stricture in cases of hernia.

**DISCUTIENTS.** Applications, which tend to disperse swellings, and extravasated fluids by promoting the action of the absorbents.

**DISLOCATION.** (from *disloco*, to put out of place.) *A Luxation.* When the articular surfaces of the bones are forced out of their proper situation, the accident is termed, a *dislocation* or *luxation.*

The most important differences of luxations are, 1. with respect to the articulation, in which these accidents take place; 2. the extent of the dislocation; 3. the direction, in which the bone is displaced; 4. the length of time the displacement has continued; 5. the circumstances, which accompany it, and which make the injury simple, or compound; 6. and, lastly, with respect to the causes of the accident.

1. Every kind of joint is not equally liable to dislocations. Experience proves, indeed, that, in the greater part of the vertebral column, luxations are absolutely impossible, the pieces of bone being articulated by extensive, numerous surfaces, varying in their form and direction, and so tied together by many powerful, elastic means, that very little motion is allowed. Experience proves, also, that the strength of the articulations of the pelvic bones can scarcely be affected by enormous efforts, unless these bones be simultaneously fractured. Boyer has therefore set down luxations of joints with continuous surfaces as impossible. (*Traité des Maladies Chirurg. T.* 4, *p.* 17.)

In the articulations with contiguous surfaces, the facility with which dislocations happen, depends upon the extent and variety of motion in such joints. Thus in the short bones of the carpus, and particularly of the tarsus, and at the carpian and tarsian extremities of the metacarpal and metatarsal bones; where flat broad surfaces are held together by ligaments, strong, numerous, and partly inter-articular, and where only an obscure degree of motion can take place; dislocations are very unfrequent, and can only be produced by uncommon violence.

The loose joints, which admit of motion in every direction, are those, in which dislocations occur most frequently: such is that of the humerus with the scapula. On the contrary, the ginglymoid joints, which only allow motion in two directions, are, comparatively speaking, seldom dislocated. The articular surfaces of the latter are of great extent, and, consequently, the heads of the bones must be pushed a great way in order to be completely dislocated; and the ligaments are numerous and strong.

2. With respect to the extent of the dislocation, luxations are either *complete*, or *incomplete*. The latter term is applied, when the articular surfaces still remain partially in contact. Incomplete dislocations only occur in ginglymoid articulations, as those of the foot, knee, and elbow. In these the luxation is almost always incomplete; and very great violence must have operated, when such joints are completely dislocated. In the orbicular articulations, the luxations are almost invariably complete.

3. In the orbicular joints, the head of the bone may be dislocated at any point of their circumference; the luxations are named accordingly *upward*, *downward*, *forward*, and *backward*. In the ginglymoid articulations, the bones may either be dislocated laterally, or forward, or backward.

4. The length of time, a dislocation has existed, makes a material difference. Recent dislocations may, in general, be easily reduced; but, when the heads of the bones have been out of their places, for several days, the reduction becomes exceedingly difficult, and, in older cases, very often impossible. The soft parts, and the bone itself, have acquired a certain position; the muscles have adapted themselves in length to the altered situation of the bone, to which they are attached, and, sometimes, cannot be lengthened sufficiently to allow the bone to be reduced. In many instances, in the course of a short time, the opening in the capsular ligament, becomes closed, so that the head of the bone cannot return into its original situation. Lastly, the luxated bone may become adherent to the parts on which it has been forced.

5. The difference is immense, in regard to the danger of the case, arising from the circumstance of a dislocation being attended, or unattended, with a wound, communicating, internally with the joint, and externally with the air. When there is no wound of this kind, the danger is generally trivial, and the dislocation is termed a *simple one:* when there is such a wound, together with the dislocation, the case is denominated *compound*, and is frequently accompanied with the most imminent peril. Indeed, the latter kind of accident often renders amputation proper.

6. The causes of dislocations are external and internal. A predisposition to such accidents may depend on circumstances natural, or accidental. The great latitude of motion, which the joint admits of; the little extent of the articular surfaces; the looseness and fewness of the ligaments; the lowness of one side of the articular cavity, as, at the anterior and inferior part of the acetabulum; and the shallowness of the cavity, as of that of the scapula; are natural predisposing causes to luxations.

A paralytic affection of the muscles around the joint, and a looseness of its ligaments, are also predisposing causes. When the deltoid muscle has been paralytic, the mere weight of the arm has been known to cause such a lengthening of the capsular ligament of the shoulder-joint, that the head of the os brachii descended two or three inches from the glenoid cavity.

The looseness of the ligaments sometimes makes the occurrence of dislocations so easy, that the slightest causes produce them. Some persons cannot yawn, or laugh, without running a risk of having their lower jaw luxated.

Such diseases, as destroy the cartilages, ligaments, and articular cavities, of the bones, may give rise to a dislocation. The knee is sometimes, but not frequently, partially luxated in consequence of a white-swelling; the thigh is often dislocated in consequence of the acetabulum and ligaments being destroyed by what is commonly named the disease of the hip-joint. Such dislocations have been called *spontaneous*, as has been already observed.

An enarthrosis joint can only be dislocated by external violence, a blow, a fall, or the action of the muscles, when the axis of the bone is in a direction, more or less oblique, with respect to the surface, with which it is articulated.

Any external force may occasion a dislocation (generally incomplete) in the ginglymoid joints; but, in the ball and socket articulations, the action of the muscles is constantly concerned in producing such an accident. So, when a person falls on his elbow, while his arm is raised outwards from his side, the force, thus applied, will undoubtedly contribute very much to push the head of the os brachii out of the glenoid cavity, at the lower and internal part. Still, the sudden action of the pectoralis major, latissimus dorsi, and teres major, which always takes place from the alarm, will also aid in pulling downward and inward the head of the bone. The violent action of the muscles alone can, under certain circumstances, produce a dislocation, without the conjoint operation of any outward force.

Dislocations are constantly attended with more or less laceration of the ligaments: in such accidents of the shoulder and hip, the capsules are always torn.

### SYMPTOMS OF DISLOCATIONS.

As Boyer justly observes, there is not any dislocation, which does not produce pain and incapacity in the limb; but, these symptoms are only equivocal, and cannot distinguish the case from a fracture, nor even from a simple contusion. He divides the symptoms of dislocations into those which may be recollected from the circumstances attending the occurrence of the accident; and into others, which he calls present, or positive.

In order that a dislocation may happen, there must be a particular attitude of the limb during the action of the external violence. It is indeed almost impossible for the displacement to occur from the direct action of the cause on the articulation itself, which is susceptible of luxation. The action of the luxating cause is the more efficient, the further it is from the joint, and the longer the lever is, which it affects. Thus, in a fall on the side, when the arm, raised considerably from the trunk, has had to sustain all the weight of the body on a point at its inner side, the probability of a dislocation is evident, and even that the head of the bone has been forced through the lower portion of the capsular ligament.

But the symptoms, which Boyer terms positive, or present, are so numerous and clear, that there are few cases in surgery, where the diagnosis is founded on circumstances equally divested of doubt and obscurity.

1. In dislocations of orbicular joints, and complete luxations of ginglymoid joints, the articular surfaces are not at all in contact, and the point, where the dislocated bone is lodged, cannot be upon the same level with the centre of the cavity, from which it has been forced. Hence, a change in the length of the limb. In the ginglymoid joints, such alteration can only be a shortening proportioned to the extent of the displacement; for there is then an overlapping of the bones, as in the fragments of a fracture, which are longitudinally displaced. But, in the orbicular joints, the bone may be displaced and carried above, or below, the articular cavity, so that in the first event a shortening, in the second, an elongation of the limb, will be produced. But, as the direction of the member is at the same time altered, it is not always practicable to place the limbs, parallel together, nor to bring them near the trunk for the purpose of judging, whether they are lengthened, or shortened. A comparison, however, made without this advantage, will generally enable the surgeon to form a correct opinion. The proper length of a dislocated limb cannot be restored, except by putting the bone back into the cavity, from which it has slipped. This cannot in general be accomplished without considerable efforts, while a slight exertion is almost always sufficient to obtain the same effect in cases, where the shortening of the limb depends upon a fracture. It is also particularly worthy of notice, that when once the natural length of the limb has been restored in dislocations, it remains, while there are a great many fractures, in which the shortening of the member recurs after it has been made to disappear. The surgeon must also recollect, that an elongation of the limb can never happen in cases of fracture, as it does in certain dislocations.

2. In almost all complete luxations, the direction of the axis of the limb is unavoidably altered. This circumstance arises from the resistance of that portion of the articular ligaments, which has not been ruptured, as well as from the action of the muscles. In complete lateral dislocations of ginglymoid joints, the direction of the axis of the limb is not altered, on account of the total rupture of the ligaments, and even of a part of the surrounding muscles. Neither is it observable in the incomplete dislocations of such articulations, on account of the extent of the articular surfaces. But, it is strongly marked in complete luxations of these joints, where the displacement has happened in the direction of the articular movements, although in cases of this description the ligaments must be totally ruptured. The muscles, which have suffered less, are in a state of extreme tension, and must necessarily alter the axis of the limb. The tension of certain muscles, and the preservation of some of the ligaments, especially in the orbicular joints, are also a cause of a rotatory movement of the dislocated limb at the moment of the displacement, and which it afterwards retains. Thus, in luxations of the thigh, the toes, and knee, are turned outward, or inward, according as the head of the thigh bone happens to be situated at the inside, or outside of the joint. These two kinds of alteration in the direction of the limb are permanent when they depend upon a dislocation, which is quite different from what is observable in fractures, where the same changes occur, but can be made to cease at once without any particular effort.

3. The absolute immobility of a limb, or at least the inability of performing certain motions, is amongst the most characteristic symptoms of a dislocation. In some complete luxations of particular ginglymoid joints, the dislocated limb is absolutely, or very nearly incapable of any motion. Thus, in the dislocation of the forearm

backwards, the particular disposition of the bones, and the extreme tension of the extensor and flexor muscles, confine the limb in the half bent state, and at the same time resist every spontaneous motion, and likewise almost every motion, which is communicated. In the orbicular joints, the painful tension of the muscles, which surround the luxated bone, nearly impedes all spontaneous movements, but, in general, analogous motions to that, by which the displacement was produced, can be communicated to the limb, though not without exciting pain. Thus, in the dislocation of the humerus downward, the elbow hardly admits of being put near the side, nor of being carried forward, nor backward; but, it can be raised up with ease. In the dislocation of the acromial end of the clavicle, the patient can bring the arm towards the trunk, separate it a little from the side, or carry it forward or backward; but he cannot raise it in a direct way. Lastly, in the lateral complete dislocations of joints, which execute alternate motions, the patient has the power of performing no motion of the part; but, the complete destruction of all the means of union allows the limb to obey every species of extraneous impulse, and this symptom, which is besides never single, makes the nature of the case sufficiently manifest.

4. In dislocations with elongation of the displaced limb, the general and uniform tension of all the muscles arranged along it, make these organs seem as if they lay nearer the circumference of the bone, and the limb smaller than its fellow. The muscles, however, which belong to the side, from which the dislocated bone has become more distant, appear more tense than the others, and form externally a prominent line. This is very manifestly the case with the deltoid muscle, when the arm is luxated downward. On the contrary, in dislocations, where the limb is shortened, the muscles are relaxed; but, being irritated, they contract and accommodate themselves to the shortened state of the limb. Hence, the extraordinary swelling of their fleshy part, and the manifest tumefaction of the portion of the member, to which they belong. We have a striking example of this in the dislocation of the thigh upward and outward, where the muscles at the inside of the limb form a distinct oblong tumor.

The parts, which surround the affected joint, also experience alterations in their form, whenever there are muscles situated there, which are connected with the dislocated bone. Thus, in dislocations of the thigh, the buttock on the same side is flattened, if the bone is carried inward; but, it is more prominent, when the thigh bone is carried outward; and its lower edge is situated higher, or lower, than in the natural state, according as the luxation may have taken place upward, or downward. In the complete luxation of the forearm backward, the triceps is tense, and forms a cylindrical prominence, owing to the displacement of the olecranon backward, in which displacement it is obliged to participate.

5. The circumference of the joint itself presents alterations of shape well deserving attention, and, in order to judge rightly of this symptom, correct anatomical knowledge is of high importance.

The form of that part of our limbs, which answers to the joints, principally depends upon the shape of the heads of the bones. Hence, the natural relation of the bones to each other cannot be altered, without a change being immediately produced in the external form of the joint. The changes, which the muscles passing over the luxated joint at the same time undergo in their situation and direction, contribute likewise to the difference of shape, by destroying the harmony of the lines, which make the external contours.

When the head of a bone, articulated by enarthrosis, has slipped out of the cavity, instead of the rounded contours, which previously indicated the natural relation of parts, the head of the dislocated bone may be distinguished at some surrounding point of the articulation, while at the articulation itself may be remarked a flatness, caused by one of the neighbouring muscles stretched over the articular cavity, and more deeply may be perceived the outline and depression produced by this cavity itself. The bony eminences situated near the joint, and whose outlines were gradually effaced in the general form of the member, are rendered much more apparent by the displacement, so that they seem to project in a stronger degree, than in the natural state. These circumstances may all be remarked in dislocations of the humerus, and in general they are also sufficiently plain in dislocations of the orbicular joints, even when swelling has come on, though in this circumstance they are less obvious.

The lines, made by the contour of the limb and the natural relation of the bones, are so manifestly broken in dislocations of ginglymoid joints, that the case is intelligible in an instant when there is no inflammatory swelling. More certain knowledge, however, and more correct information respecting the kind of displacement, are to be obtained, by attentively examining the changes of position, which the bony prominences, making the termination of the bones articulated together, have undergone, and which are the more obvious in these joints, inasmuch as they give attachment to the principal muscles. The natural relations of these processes being known, the least error of situation ought to strike the well-informed attentive practitioner. Thus, in the elbow joint, a considerable difference in the respective height, and in the distances between the olecranon and internal and external condyles, can be easily distinguished. But in such joints, the thing is not so easy, when the surrounding parts are so swelled and tense, as to make the bony projections deeper from the surface, and less obvious to examination. Even then, however, a good surgeon will at least find something to make him suspect the dislocation, and the suspicion will be confirmed when he again examines the part on the swelling beginning to subside. It is of the utmost consequence to make out what the case is as early as possible; for, the unnatural state, in which the soft parts are placed, keeps up the swelling a long while; and if the surgeon wait till this has entirely subsided, before he ascertains that the bones are luxated, he will have waited till it is too late to think of reducing them, and the patient must remain deprived for ever afterwards of the free use of his limb. (See *Boyer's Traité des Maladies Chir. T.* 4, *p.* 45, *&c.*)

Dislocations are also, sometimes, attended with particular symptoms, arising altogether from the pressure caused by the head of the luxated bone on certain parts. The sternal end of the clavicle has been known to compress the trachea, and impede respiration: the head of the humerus may press upon the axillary plexus of nerves, and produce a paralytic affection of the whole arm.

As Kirkland has observed, there are some luxations, which are far worse injuries than fractures; of this description are, dislocations of the vertebræ, cases which are almost always fatal; dislocations of the long bones, with protrusion of their heads through the muscles and skin, and attended with severe inflammation, gangrene, tetanus, extensive abscesses, and subsequent caries; causes, which frequently exhaust the patient, and occasion death, as the practice of every man of experience must have convinced him.

## PROGNOSIS.

In general, every unreduced dislocation, must deprive the patient more or less completely of the use of the limb; for, nature cannot in any of these cases re-establish the natural relations which are lost. There is indeed an effort made to restore some of the motions, and the use of the limb in a certain degree; but, it is always very imperfectly accomplished, and in the best cases, only a confined degree of motion is re-established. Nature cannot in any way alter the lengthened, or shortened state of the limb; and she can only correct in a very imperfect manner its faulty direction. There are even some cases, in which nature can effect no amendment whatsoever; as, for instance, complete dislocations of ginglymoid joints in the direction of the articular movements. So great an alteration would be requisite in the surfaces in contact, and so extensive an elongation of the muscles, that, in such cases, the dislocated part must continue nearly quite motionless.

There are, however, a few exceptions to this general rule. The arthrodia joints are seldom extensively displaced; and as, in the natural state, their motions are very limited, it is not of so much importance, that these motions are lost, in consequence of the natural relations not having been restored. Thus, the bones of the carpus, those of the tarsus, and the acromial end of the clavicle, may be dislocated, and be reduced either imperfectly, or not at all, without the functions of the limb, to which they belong, being materially impaired. (*Boyer Traité des Maladies Chirurgicales, T.* 4, *p.* 54.)

Dislocations of enarthrosis are generally much less dangerous, than those of ginglymoid joints. The action of the muscles has a great share in producing the former; the violence done to the external parts is less; and the laceration of the soft parts is not so considerable. Even, in the same kind of joints, the seriousness of the case depends on the largeness of the articular surfaces, and the number and strength of the muscles and ligaments.

Dislocations of ginglymoid joints, however, are more easily reduced, than those of enarthrosis articulations, the muscles of which are frequently very powerful, and capable of making great resistance to the efforts of the surgeon. This is frequently seen in luxations of the shoulder, and thigh.

It may be said, however, of the luxations of enarthrosis joints, that, if they happen the most easily, they are attended with less injury; and that, although their reduction may require considerable efforts, yet it can be accomplished, and the accident leaves no ill effects. On the contrary, in dislocations of ginglymoid joints, the same reason, which renders them more unfrequent, makes them also more serious. The solidity of these joints prevents the uniting means from being destroyed, except by great violence; and the extent of the articular surfaces does not permit a considerable displacement, especially, a complete one, without extensive injury of the ligaments, and surrounding soft parts. It is for these reasons, no doubt, that compound luxations and protrusions of the heads of the bones, are most commonly seen in the ginglymoid articulations.

Still it must be allowed, that the incomplete dislocations of these joints, unattended with much displacement, are not at all serious accidents.

The more recent a luxation is, the more easy it is to reduce, and therefore, *cæteris paribus*, the less grave is the injury. In this point of view, dislocations of ginglymoid joints are the most serious, because they become soonest irreducible.

Simple dislocations are much less dangerous, than those, which are complicated with contusion, the injury of a large nerve, or blood-vessel, inflammatory swelling, fracture, wound, and especially protrusion of one of the articular surfaces. (*Boyer Traité des Maladies Chirurgicales, T.* 4, *p.* 55, 56.)

Dislocations from disease, termed *spontaneous*, cannot admit of reduction: when this accident happens in the hip-disease, it is not merely in consequence of the ligaments being destroyed, the brim of the acetabulum itself is often annihilated.

### TREATMENT OF DISLOCATIONS IN GENERAL.

We shall first introduce the valuable remarks of Mr. Pott upon this part of the subject, and then add such others, as seem entitled to attention. Mr. Pott says, that the principle, concerning the extended or relaxed, that is, the resistant or non-resistant state of the muscles, as depending on the position of the limb, may be applied with equal truth and equal advantage to dislocations, as to fractures. Neither of them can indeed be rightly understood, or judiciously treated, without such consideration. In both, a perfect knowledge of the disposition, force, attachments and uses of the muscles, at least those of the limbs, are indispensably necessary.

Mr. Pott observes: By what our forefathers have said on the subject of luxations, and by the descriptions and figures which they have left us of the means they used, of what they call their organs and machinemata, it is plain that force was their object, and that whatever purposes were aimed at or executed by these instruments or machines, were aimed at and executed principally by violence.

Many, or most of them indeed, (says Mr. Pott) are much more calculated to pull a man's joints asunder, than to set them to rights. Hardly any of them are so contrived as to execute the purpose for which they should be used, in a manner most adapted to the nature or mechanism of the parts on which they are to operate. The force or power of some of the instruments is not always determinable, as to degree, by the operator, and consequently may do too little or too much, according to different circumstances in the case, or more or less caution or rashness in the surgeon.

Many of these instruments are now laid aside, and some few have been so altered, as to become useful; but before Mr. Pott, the same kind of principle, on which these instruments were originally founded and constructed, very generally prevailed, and violence was used, to the great fatigue, pain, and inconvenience of the patient in many cases, in which dexterity joined to a knowledge of the parts, would have executed the same purpose with facility and ease.

In dislocations, as in fractures, says Pott, our great attention ought to be paid to the muscles belonging to the part affected. These are the moving powers, and by these the joints, as well as other moveable parts, are put into action; while the parts to be moved are in right order and disposition, their actions will be regular and just, and generally determinable by the will of the agent, (at least in what are called voluntary motions;) but when the said parts are disturbed from that order and disposition, the action or power of the muscles does not therefore cease; far from it, they still continue to exert themselves occasionally; but instead of producing regular motions, at the will of the agent, they pull and distort the parts they are attached to, and which by being displaced cannot perform the functions for which they were designed.

"Hence principally, (says this author,) arise the trouble and difficulty which attend the reduction of luxated joints. The mere bones composing the articulations, or the mere connecting ligaments, would in general afford very little opposition; and the replacing the dislocation would require very little trouble or force, was it not for the resistance of the muscles and tendons attached to and connected with them: for by examining the fresh joints of the human body, we shall find that they not only are all moved by muscles and tendons, but also, that although what are called the ligaments of the joints do really connect and hold them together, in such manner as could not well be executed without them, yet in many instances, they are, when stript of all connection, so very weak and lax, and so dilatable and distractile, that they do little more than connect the bones and retain the synovia; and that the strength, as well as the motion of the joints, depends in great measure on the muscles and tendons connected with and passing over them; and this in those articulations which are designed for the greatest quantity, as well as the celerity of motion. Hence it must follow, that as the figure, mobility, action, and strength of the principal joints, depend so much more on the muscles and tendons in connection with them, than on their mere ligaments; that the former are the parts which require our first and greatest regard, these being the parts which will necessarily oppose us in our attempts for reduction, and whose resistance must be either eluded or overcome; terms of very different import, and which every practitioner ought to be well apprised of."

Mr. Pott lays great stress on the necessity of examining the joints in the recent subject, not merely those of the skeleton, in order to understand the subject of dislocations.

The following are principles laid down by this author.

1. Although a joint may have been luxated by means of considerable violence, it does by no means follow, that the same degree of violence is necessary for its reduction.

2. When a joint has been luxated, at least one of the bones of which it is composed is detained in that unnatural situation by the action of some of the muscular parts in connection with it; which action, by the immobility of the joint, becomes as it were tonic, and is not under the direction of the will of the patient.

3. That the mere bursal ligaments of some of the joints, endued with great mobility, are weak, distractile, and constantly moistened; that for these reasons they are capable of suffering considerable violence without being lacerated; but that they are also sometimes most certainly torn.

4. That, did the laceration of the said ligaments happen much more frequently than Mr. Pott believes it does, yet it cannot be a matter of very great consequence, as it neither totally prevents reduction, when timely and properly attempted, nor a consequent cure. The difficulty of reduction arising from this circumstance will be noticed again, when we speak of dislocations of the shoulder.

5. That supposing such accident to be frequent, yet as it is impossible to know, with any kind of certainty, whether it has happened or not, or in what part of the ligament, it cannot be admitted as a rule for our conduct, nor ought such mere conjecture to produce any deviation from what we ought to do, were there no such supposition. Could we know with certainty when and where this had happened, velry useful information might indeed be drawn from it.

6. That all the force used in reducing a uxated bone, be it more or less, be it by hands, towels, ligatures, or machines, ought always to be applied to the other extremity of the said bone, and as much as possible to that only. Some eminent surgeons have disputed this maxim, especially in France, as we shall hereafter notice again.

In every joint capable of dislocation, the same circumstance, which renders it liable to be displaced, is also a very considerable assistance in its reduction. Mr. Pott means the dilatability or distractile power of the ligaments, or their capacity of giving way when stretched or pulled at.

This is perhaps the strongest argument which can be produced, why all the force made use of in reducing a dislocated joint should be applied to that bone only, and not to the next. By the yielding nature of the ligaments of the luxated joint, reduction is to be accomplished. The ligaments of the other articulation, which is not luxated, are yielding also; and all the force which is applied to the bone below or adjoining, must necessarily be lost in the articulation which is not luxated, and can be of little or no service in that which is. This remark, though made by Pott, and generally received as true, is very incorrect; for, it tends to state, that if you pull at the ankle, or wrist, the force does not operate on the hip, or shoulder.

" Let this principle (says Pott) be applied to the dislocation of the joint of the shoulder, and it will shew us why the ambi, in which the whole arm is tied down, and subjected to the extending power of the said instrument, is defective, and may be pernicious. Why instruments built on the same general principle, but in which the fore-arm is not fastened down, but left at liberty and not subjected to the ligature, execute their purpose with a great deal less force. Why the vulgar but frequently very successful method of reducing this joint, by placing the operator's heel in the axilla of the supine patient, sometimes fails, the surgeon not having proper assistance, and contenting himself with pulling at the patient's wrist only. It will also shew us, why, in the case of a luxated os femoris at the joint of the hip, the strength of five or six people divided between the joint of the knee and that of the ankle, shall be insufficient; and that of four, nay three of the same assistants, shall in the same case prove sufficient, by being all, and properly applied to the knee and femur only."

Mr. Pott's next principle is, 7. That in the reduction of such joints, as are composed of a round head, received into a socket, such as those of the shoulder and hip, the whole body should be kept as steady as possible, for the same reason as in the foregoing.

8. That in order to make use of an extending force with all possible advantage, and to excite thereby the least pain and inconvenience, it is necessary that all parts

serving to the motion of the dislocated joint, or in any degree connected with it, be put into such a state as to give the smallest possible degree of resistance.

This, Mr. Pott considers as the first and great principle by which a surgeon ought to regulate his conduct in reducing luxations. This, says he, will shew us why a knowledge of all the muscular and tendinous parts, acting upon, or in connection with the articulations, is absolutely necessary for him who would do his business scientifically, with satisfaction to himself, or with ease to his patient. It will shew us, that the mere position of the limb below the luxated joint, is what must either relax or make tense the parts in connection with that joint, and consequently that posture is more than half of the business. It will shew us, why sometimes the luxated os humeri slips in, as it were, of its own accord, by merely changing the position of the arm, when very violent attempts, previous to this, have proved successless. It will shew us, why extending the arm in a straight line horizontally, or so as to make a right angle with the body, must in some instances render all moderate attempts fruitless. Why the method of attempting reduction by the heel in the axilla is so often successful, notwithstanding two very considerable disadvantages under which it labours, viz. part of the force being lost in the elbow, and the tense state of one head of the biceps cubiti. Why the tying down the fore-arm in the common ambi is wrong, for the same reasons. Why the fore-arm should at all times (let the method of reduction be what it may) be bent, viz. because of the resistance of the long head of the biceps in an extended posture. Why, when the os humeri is luxated forward, or so that its head lies under the great pectoral muscle, the carrying the extended arm backward, so as to put that muscle on the stretch, renders the reduction very difficult, and why, on the contrary, the bringing the arm forward, so as to relax the said muscle, removes that difficulty, and renders reduction easy. Why the reduction of a luxated elbow should always be attempted by bending the said joint. Why, when the inner ankle is dislocated in consequence of a fracture of the fibula, it is extremely difficult at all times, and sometimes impracticable, either to reduce or to keep reduced the said joint, while the leg is in an extended posture; and why a bent posture of the leg enables us with ease to accomplish both these ends. Why the case of dislocation of the head of the os femoris, (be it in what manner it may) a straight position of the leg and thigh will always increase the difficulty of reduction; and why that very distorted and bent position, in which the patient will always place it for his own ease, is and must be the posture most favourable for reduction; because it is and must be that posture in which the muscles, most likely to make opposition, are most relaxed and rendered least capable of resistance.

9. That in the reduction of such joints as consist of a round head, moving in an acetabulum or socket, no attempt ought to be made for replacing the said head, until it has by extension been brought forth from the place where it is, and nearly to a level with the said socket.

This will shew us, continues Mr. Pott, another fault in the common ambi, and why that kind of ambi, which Mr. Freke called his commander, is a much better instrument than any of them, or indeed than all; because it is a lever joined to an extensor; and that capable of being used with the arm, in such position as to require the least extension, and to admit the most; besides which it is graduated, and therefore perfectly under the dominion of the operator.

It will shew us, says Pott, why the old method by the door or ladder, sometimes produced a fracture of the neck of the scapula; as he has seen it do himself.

Why if a sufficient degree of extension be not made, the towel over the surgeon's shoulder, and under the patient's axilla, must prove an impediment rather than an assistance, by thrusting the head of the humerus under the neck of the scapula, instead of directing it into its socket.

Why the bar, or rolling-pin, under the axilla produces the same effect.

Why the common method of bending the arm (that is, the os humeri) downward, before sufficient extension has been made, prevents the very thing aimed at; by pushing the head of the bone under the scapula, which the continuation of the extension for a few seconds only would have carried into its proper place.

I know it is said, observes Mr. Pott, that mere extension only draws the head of the bone out from the axilla, in which it was lodged, but does not replace it in the acetabulum scapulæ. To which I will venture to answer, that when the head of the os humeri is drawn forth from the axilla, and brought to a level with the cup of the scapula, it must be a very great and very unnecessary addition of extending force, that will or can keep it from going into it. All that the surgeon has to do, is to bring it to such level; the muscles attached to the bone will do the rest for him, and that whether he will or not.

Indeed, continues this author, if all the rational means and methods for reducing a luxated shoulder be examined, they will be found to act upon this principle, however differently this matter may appear to those who have not attended to it. Even the common ambi succeeds by means of the extension, which the carrying the arm down with it produces, and not by its lever. That part of the instrument, so far from helping, is often a considerable hindrance, and even sometimes frustrates the operator's intention, by pushing the head of the bone against the scapula, before it is sufficiently drawn out from the axilla.

10. The last of Pott's principles is, that whatever kind or degree of force may be found necessary for the reduction of a luxated joint, that such force be employed gradually; that the lesser degree be always first tried, and that it be increased gradatim.

Whoever, says Pott, reflects on what is intended by extension, what the parts are which resist, and how that resistance may be best overcome, will want little argument to induce him to accede to this principle; the advantages deducible from attending to it, and the disadvantages which may and do follow the neglect of it, are so obvious.

They who have not made the experiment, will not believe to how great a degree a gradually increased extension may be carried without any injury to the parts extended; whereas great force, exerted hastily, is productive of very terrible and very lasting mischief. (See *Remarks on Fractures and Dislocations.*)

Dislocations in general cannot be reduced without trouble; but, after the reduction is accomplished, it is easily maintained. Fractures, on the contrary, are, generally speaking, easy of reduction; but they cannot be kept in this desirable state without difficulty. The moment the extension is remitted, the muscles act, the ends of the broken bone slip out of their proper situation with respect to each other, and the distortion of the limb recurs. As a modern writer has observed, the reduction is only a small part of the treatment of fractures: the most essential point of it is the almost daily care, which a fracture demands during the whole time requisite for its consolidation. The contrary is the case in luxations. Here, in fact, the reduction is every thing, if we put out of consideration the less frequent cases, in which the dislocation is complicated and attended with such grave circumstances, as render it indispensably necessary to continue for a length of time the utmost surgical care. But, even then, the protracted treatment is less for the dislocation itself, than for the extraordinary circumstances, with which it is accompanied. (See *Roux, Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 207.)

The extending force has been recommended to be applied by all the ancient writers to the luxated bone; for instance, to be applied above the knee in dislocations of the thigh-bone, and above the elbow in those of the humerus. We have stated, that Pott advised this plan, and the same practice is approved by J. L. Petit, Duverney, and Callisen, and adopted almost generally in our own country.

However, many of the best modern surgeons in France, for instance, Fabre, D'Apouy, Desault, Boyer, Richerand, and Leveillé, have advised the extending force not to be applied on the luxated bone, but, on that, with which it is articulated, and as far as possible from it. It is said, that this plan has two most important advantages: first, the muscles, which surround the dislocated bone, are not compressed, nor stimulated to spasmodic contractions, which would resist the reduction; secondly, the extending force is much more considerable, than in the other mode; for, by using a long lever, we obtain a greater degree of power.

In Pott's remarks, we find even him influenced by the prevailing prejudice against the above practice, that part of the extending force is lost on the joint, intervening between the dislocation, and the part, at which the extension is made. This notion is quite unfounded, as every man, who reflects, for one moment, must soon perceive. When extension is made at the wrist, the ligaments, muscles, &c. which connect the bones of the fore-arm with the os brachii, have the whole of the extending force operating on them, and they must obviously transmit the same degree of extension, which they receive, to the bone above, to which they are attached. This matter, indeed, seems so plain, that I think it would be an insult to the reader's understanding to say any more about it, than that such eminent surgeons, as have contrary sentiments, can never have taken the trouble to reflect for themselves on this particular subject. Whether the force necessary to be exerted in some instances, might not have a bad effect on the intervening joint, I cannot pretend to say; but, as Desault's practice was very extensive, and he did not find any objection of this kind, we have, perhaps, no right to conclude, that such a one would exist.

Extension may either be made by means of assistants, who are to take hold of napkins, or sheets, put round the part, at which it is judged proper to make the extension; or else a multiplied pulley may be used. In general, the first plan is preferred. Nothing more need be added to what Mr. Pott has stated, concerning the propriety of using moderate force in the first instance, and increasing the extending power very gradually.

The extension should always be first made in the same direction, into which the dislocated bone is thrown; but, in proportion as the muscles yield, the bone is to be gradually brought back into its natural position. Thus the head of the bone becomes disengaged from the parts, among which it has been placed, and brought back to the cavity, which it has left, by making it describe the same course, which it took in escaping from it.

The extension will prove quite unavailing, unless the bone, with which the dislocated head is naturally articulated, be kept motionless by counter-extension, or a force at least equal to the other, but made in a contrary direction.

The mode of fixing the scapula and pelvis, in luxations of the shoulder and thigh, will be described in speaking of dislocations of the arm and thigh.

In dislocations of ginglymoid joints, extension and counter-extension are only made, for the purpose of diminishing the friction of the surfaces of the joints, so as to be enabled to put them in their natural situation.

When the attempts at reduction fail, the want of success is sometimes owing to the extension not being powerful enough, and the great muscular strength of the patient, whose muscles counteract all the efforts to replace the bone.

In the latter case, the patient may be freely bleed, and put into a warm bath, so as, if possible, to make him faint; hence the opening in the vein should be made large, because a sudden evacuation of blood is more likely to produce swooning, than a gradual discharge of it; and the patient, for the same reason, may be bled as he stands up. In very difficult cases, some authors have even recommended intoxication, which is certainly a most favourable opportunity for eluding the resistance, made to reducing dislocations, in very powerful subjects.

However, long continued, unremitting, not too violent, extension, will at last overcome the muscles of the most athletic man, and such practice is the most entitled to praise.

Dislocations of orbicular joints can seldom be reduced, after a month, though Desault used to succeed, with great violence, at the end of three or four. Dislocations of ginglymoid articulations are, in general, irreducible after twenty, or twenty-four days, in consequence of anchylosis having taken place.

The reduction of a dislocation is known by the limb recovering its natural length, shape, and direction, and being able to perform certain motions, not possible while the bone was out of its place. The patient experiences a great and sudden diminution of pain; and, very often, the head of the bone makes a noise at the moment, when it returns into the cavity of the joint.

In order to keep the bone from slipping out of its place again, we have only to hinder the limb from moving. When splints can act powerfully in steadying the joint, they are, however, very often used, as in dislocations of the ankle, wrist, &c. As the humerus cannot be luxated, except when at some distance from the body, a return of its dislocation will be prevented by confining the arm in a sling, in such a way, that it cannot be raised from the side of the trunk. The spica bandage, applied after such an accident, is more satisfactory to the patient, than really efficacious. Whatever bandage is used to keep the arm from moving, should be put on the other end of the bone, as far as possible from the centre of motion.

### COMPOUND DISLOCATIONS.

*Compound Dislocations*, as we have said, are those, which are attended with a wound communicating with the cavities of the injured joints. These accidents, like compound fractures, are frequently attended with great danger; and the same nicety of judgment is requisite in determining, whether amputation ought to be immediately performed, or an effort made to preserve the limb, as in cases of compound fractures. What we shall state on the latter subject, will, for the most part, be applicable to the present one.

The luxation of a large joint, being conjoined with an external wound, leading into the capsular ligament, is a circumstance, that has a particular tendency to increase the danger of the accident. In many cases, we see injuries of this description followed by violent and extensive inflammation, abscesses and mortification, fever, delirium, and death. When the patient is much advanced in years, is much debilitated, or of an unhealthy irritable constitution, compound luxations, especially, if attended with much contusion and other injury of the soft parts, and wrongly treated, very often have a fatal termination. This, however, is not the general event of compound dislocations, and whatever may have happened in former times, we now know, that, in the present improved state of surgery, these accidents mostly admit of cure. I would not, however, by any means insinuate censure against every instance of amputation performed in such cases. I know, that this operation is occasionally indispensible immediately after the accident, and I am equally aware, that it may become necessary in a future stage, when extensive abscesses, or sloughing, joined with threatening constitutional symptoms, have taken place. My only design is to recommend the endeavour to cure the generality of compound luxations. But, if a case were to present itself, attended with serious contusion and laceration of the soft parts, I should be as earnest an advocate for amputation as any surgeon whatsoever.

The treatment of a compound dislocation requires the reduction to be effected without delay, and with as little violence and disturbance as possible. The limb is then to be placed in splints, with the necessary pads, eighteen-tailed bandage, &c. The wound is to be freed from any dirt, clots of blood, or other extraneous matter, and its lips are to be accurately brought together with strips of adhesive plaster. The joint is to be covered with linen wet with the saturnine lotion; the bandage is to be loosely laid down, and the splints fastened on the limb with their proper straps, or pieces of tape, and the limb is to be kept perfectly at rest in an eligible posture. The patient, if strong and young, is to be bled. This last practice may be more freely adopted in the country, than in London, or large hospitals. Purging, however, must never be omitted, and an anodyne, the first night, or two, will be highly proper. Saline draughts, antimonials, and a low regimen, are also indicated during the first few days of the symptomatic fever, which commonly follows so serious an accident.

If the case takes a favourable course, the constitutional fever will not be excessive, nor will the pain and inflammation of the limb be immoderate. Sometimes, the wound unites, more or less, without suppuration; a circumstance most particularly to be desired, as tending more than any thing else to lessen the danger, by changing the case, as it were, from a compound into a simple one. In other cases, the wound is not united; but, the inflammation and suppuration are not violent, nor extensive; the constitution is not dangerously disturbed; and hopes of ultimate success may be reasonably entertained. When the wound is disposed to heal favourably, lint and adhesive plaster, or a pledget of soft soap cerate, are the best dressings. In other instances, while the suppuration is copious, and the parts are tense and painful, emollient poultices are the most eligible applications.

When the symptomatic fever, and first inflammatory symptoms, are over, and much discharge prevails, attended with marks of approaching weakness, the patient is to be allowed more food, and be directed to take bark, cordials, porter, wine, &c. If his nights are restless, he must have opiates; if he sweats profusely, sulphuric acid; and, in short, all such medicines, as his particular complaints may require, are to be prescribed.

When the inflammation of a compound dislocation is violent, or extensive, general bleeding, the application of leeches, and the use of fomentations, and poultices, are the most likely means of lessening the mischief. Yet, it is only in strong habits, that venesection to any extent can be prudently practised in large cities, or crowded hospitals.

In certain examples, the most skilful treatment is unavailing. The joint and limb become affected with considerable pain and swelling; the fever runs high; delirium comes on; and the patient may even perish from the violence of the first symptoms, the limb being generally at the same time attacked by gangrene. If these first dangers are avoided, the wound may yet not heal favourably; the inflammation may be considerable, or of an erysipelatous nature; large abscesses under the fasciæ may be formed; the bones may become carious; and the hectical symptoms, and sinking state of the patient, may make the only chance of recovery depend upon amputation. But, even this operation is sometimes deferred till too late, and the patient must be left to his miserable fate.

Whoever gives the smallest reflection to the nature of compound fractures, will perceive, that it is often a matter of the last importance, to make a right decision at the very beginning, whether amputation should be immediately done, or whether an attempt to save the limb ought to be made. In some instances, the patient's sole chance depends upon the operation being performed at once, without the least delay, and the opportunity of doing it never returns. The surgeon should take off the limb as soon as he has seen the nature of the injury, and not wait, till a general tendency to swelling and gangrene has spread through the member, and every action of the system is disturbed. Amputation, under these circumstances, is undoubtedly done with a very diminished chance of success; and, until the late facts adduced by M. Larrey and Mr. Lawrence, was altogether prohibited. (See *Amputation* and *Mortification.*)

But, besides this first critical period, the surgeon often has to exercise a nice degree of judgment in a future stage of the case; I mean, when the suppuration is copious, the wound open, the bones carious, and the health impaired. Here the practitioner may sometimes err, in taking off a limb, that might be saved; or, he may commit a worse fault, and make the patient lose his life, in a fruitless attempt to save the member. No precepts can form the right practitioner in this delicate part of surgery; genius alone cannot do it; the opportunity of making observations, and the talent of profiting by them, are here the things, which make the consummate surgeon.

It should ever be recollected, in regard to bad compound dislocations, that in young subjects, and in a salubrious air, many cases will do well, which in old persons, and in the polluted atmosphere of London, and crowded hospitals, would be fatal without amputation.

There is a practice, in regard to compound dislocations, which appears to me to deserve universal condemnation; I mean the plan of sawing off the head of the luxated bone. According to M. Levéillé, this method is recommended by Hippocrates as a means of accelerating and perfecting the cure. (*Nouvelle Doctrine Chirurgicale, Tom. 2, p.* 44.) This extraordinary scheme, however, seems not to have done sufficient good, in ancient times, to obtain a lasting reputation. In fact, when it was mentioned by the late Mr. Gooch, it had sunk into such oblivion, that it was received as an entirely new proposal. "Compound luxations (says this author) are of a more dangerous nature, than compound fractures, for very plain reasons; but, if a surgeon should judge it advisable to attempt saving a limb under such threatening circumstances, *I am inclined to think, from what I have observed, he will be more likely to succeed, by sawing off the head of the bone, especially if it has long been quite out and exposed to the air.*"

Mr. Gooch afterwards takes notice of a case, in which Mr. Cooper, of Bungay, sawed off the heads of the tibia and fibula, and preserved the limb, the patient being able to walk and work for his bread for many years afterwards. Other examples are also briefly mentioned, in which the lower head of the radius was sawn off, and the head of the second bone of the thumb.

Mr. Hey, of Leeds, has been induced to make trial of this plan in a compound luxation of the ankle. The example, however, which he has published, is decidedly highly unfavourable to the practice, as the following passage will shew: "I was in hopes, that this patient would have been able to walk stoutly; but, in this, I was disappointed. He walked indeed without a crutch; but, his gait was slow, his leg remaining weak, and his toes turning outwards, which rather surprised me, as his leg was very straight, when I ceased attending him."

Mr. Hey tells us, that he has not recited this case, with the view of recommending a similar practice in all cases of this accident; for, he has not always adopted it; nor, is he of opinion, that the same mode of treatment, whether by replacing the bones, sawing off their extremities, or amputating the limb, ought to be universally practised. When the laceration of the capsular ligament and integuments is not greater, than is sufficient to permit the head of the tibia to pass through them; and when, at the same time, the joint, or contiguous parts, have suffered no other injury; Mr. Hey recommends the replacing of the bone, and an union of the integuments by suture, with the treatment adapted to wounds of the joints. (*Practical Observations in Surgery, Chap.* 11, *Edit.* 2.)

I am sorry, that this respectable surgeon's name may hereafter be brought forward in justification of a method, which appears to have nothing to recommend it, either in reason, or experience. That in two or three cases, recorded by this gentleman and Mr. Gooch, the patients recovered with a new sort of joint, only proves to my mind, the great resources and activity of nature, and her occasional triumph over the opposition she meets with from bad and injudicious surgery. A limb, so treated, must ever afterwards be shorter than its fellow, and consequently the patient be more or less a cripple. We have seen, that in the only instance, published by Mr. Hey, considerable deformity was the consequence of the practice. I cannot help adding my belief, that Mr. Hey would experience more success in the treatment of compound dislocations, if he were to relinquish the objectionable method of sewing up the wound. In such accidents, every kind of irritation should be avoided as much as possible, and that the wound may be conveniently closed with sticking plaster, the observation, of numerous cases in St. Bartholomew's hospital, has perfectly convinced me. In this munificent institution, under the disadvantage of the air of London and an hospital, compound luxations are treated with marked success, and I feel warranted in ascribing the circumstance to the mode of treatment, which is conducted on the principles explained in this section of the Dictionary.

The only case, in which the plan of sawing off the head of the bone can be at all proper, is when a compound dislocation cannot be reduced, notwithstanding the enlargement of the wound in the skin, and every other possible means. There is no other mode of preventing the formidable symptoms, which would ensue, were the bone left in a state of protrusion through the integuments; nor is there any better way of alleviating such symptoms after they have actually begun. M. Roux gives much praise to the English surgeons for the judicious boldness, which they have evinced in cases of this description. Although Fabricius Hildanus, Ferrand, Desault, Laumonier, and several other French surgeons, have like many British practitioners, ventured to remove the whole of the astragalus, when this bone was totally separated from the scaphoides, and protruded, in compound luxations, yet M. Roux acknowledges, that the bold practice, of sawing off the lower end of the humerus, the lower end of the radius, the lower end of the tibia, and also of the fibula, at the same time, originated with, and was first executed by English surgeons. (*Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 208, 209.)

### PARTICULAR DISLOCATIONS.

#### *Dislocations of the Lower Jaw.*

The lower jaw can only be luxated forward, and either one, or both of its condyles may become displaced in this direction. Every dislocation, except the one forward, is rendered impossible by the formation of the parts. The lower jaw cannot even be dislocated forward, unless the mouth, just before the occurrence of the accident, be very much open. Whenever the chin is considerably depressed, the condyles slide from behind forward, under the transverse root of the zygomatic processes. The cartilaginous cap, which envelops the condyles, and follows them in all their motions, still affords them an articular cavity; but, the depression of the bone continuing, the ligaments give way, the condyles glide before the *eminentiæ articulares*, and slip under the zygomatic arches. Hence, a dislocation mostly happens, while the patient is laughing, gaping, &c. A blow on the jaw, when the mouth is wide open, may easily cause the accident. The case has occasionally arisen from the exercise of great force in drawing out the teeth. Whenever the jaw has once been dislocated, the same causes more easily reproduce the occurrence. In certain individuals, the ligaments are so loose, and the muscles so weak, that a dislocation is produced by any slight attempt to yawn, laugh, or (as Lamotte has observed) to bite any substance, which is rather large. (*Levéillé, Nouvelle Doctrine Chirurgicale, Tom.* 2, *p.* 54.) There have been persons, who could scarcely ever laugh heartily, without having their lower jaws luxated, in consequence of so doing. But, of all the causes of this occurrence, yawning alone, even without the combination of any external force, is by far the most common.

When the jaw is depressed, and its angles, to the external sides of which the masseters are attached, are carried upwards and backwards, if these muscles contract, the greater part of their force is employed to bring the condyles into the zygomatic depression. (*Boyer.*)

Dislocations of the lower jaw are attended with a great deal of pain, which Boyer imputes to the pressure produced by the condyles on the deep seated temporal nerves, and those going to the masseters, which nerves pass before the roots of the zygomatic process. The mouth is wide open, and cannot be shut. It is more open in recent dislocations, than in those, which have continued for some time. An empty space is felt before the ear, in the natural situation of the condyles. The coronoid process forms under the cheek-bone a prominence, which may be felt through the cheek, or from within the mouth. The cheeks and temples are flattened by the lengthening of the temporal, masseter, and buccinator musles. The saliva flows in large quantities from the mouth, the secretion of which fluid is greatly increased by the irritation of the air. The arch, formed by the teeth of the lower jaw, is situated more forward, than that formed by the teeth of the upper jaw. The patient can neither speak nor swallow during the first days after the accident. (*Boyer.*) When only one condyle is dislocated, the mouth is distorted, and turned towards the opposite side, while the fellow teeth of the jaws do not correspond. Hey asserts, however, that the position of the chin is frequently not perceptibly altered. (*Practical Observations, p.* 322.)

The symptoms are not so well marked, when the accident has remained unreduced for several days, or weeks. In such instances, the chin becomes gradually approximated to the upper jaw; the patient recovers by degrees the faculty of speaking and swallowing; but, he stammers, and the saliva dribbles from his mouth. The sufferings induced by a dislocated jaw are certainly great enough to be sometimes fatal, if the case continue unrectified; but, we are not to believe Hippocrates, when he positively declares the accident mortal, if not reduced before the tenth day.

Monteggia attended a man, two months after such a luxation, which had not been understood, and Fabricius ab Aquapendente assures us, that he had never seen the prognostic of Hippocrates verified, though he had had many patients of this sort under his care. (*Leveillé, Nouvelle Doctrine Chirurgicale, Tom.* 2, *p.* 58.)

Dislocations of the lower jaw are to be reduced in the following manner: The surgeon is first to wrap some linen round his thumbs to keep them from being hurt by the patient's teeth, and then introduce them into the mouth, as far as possible on the grinding teeth. At the same time, he is to place his fingers under the chin and base of the jaw, and while he depresses the molares with his thumbs, he raises the chin with his fingers, by which means the condyles become disengaged from their situation under the zygomas; at which instant the muscles draw those parts so rapidly back into the articular cavities again, that the surgeon's thumbs would very probably be hurt, did he not immediately move them outward between the cheek and the jaw.

The reduction being accomplished, a recurrence of the accident is to be prevented by applying a four-tailed bandage, as recommended for the fractured jaw. The patient should for some time avoid eating food, which requires much mastication.

The ancients used to place two pieces of stick between the grinding teeth, and while they used these as levers to depress the back part of the bone, they raised the chin by means of a bandage. John de Vigo has described this method from Salicetus, Lanfranc, and Guido di Cauliaco; but, it is not preferable to the modern plan, in regard to efficacy; and it has the disadvantage of exposing the teeth to injury.

### DISLOCATIONS OF THE VERTEBRÆ.

The large surfaces, with which these bones support each other; the number and thickness of their ligaments; the strength of their muscles; the little, which each vertebra naturally moves; and the vertical direction of their articular processes; make dislocations of the dorsal and lumbar vertebræ quite impossible, unless there be also a fracture of the processes just mentioned. Of these cases I shall merely remark, that they can only result from immense violence; that the symptoms would be an irregularity in the disposition of the spinous processes, retention or incontinence of the urine and feces, paralysis and a motionless state of the lower extremities, the effects of the pressure, or other injury, to which the spinal marrow would be subjected. Similar symptoms may also arise, when the spinal marrow has merely undergone a very violent concussion, without any fracture or dislocation whatever; and, it is certain, that most of the cases mentioned by authors as dislocations of the lumbar and dorsal vertebræ, have only been concussions of the spinal marrow, or fractures of such bones.

The cervical vertebræ, however, not having such extensive articular surfaces, and having more motion, are occasionally luxated. The dislocation of the head from the first vertebra, and of the first vertebra from the second, particularly the last accident, is the most common; but luxations of the cervical vertebræ lower down, though very rare, are possible. *(Boyer.)*

### DISLOCATION OF THE HEAD FROM THE FIRST VERTEBRA, OR ATLAS.

The os occipitis, and first cervical vertebra are so firmly connected by ligaments, that there is no instance of their being luxated from an external cause, and, were the accident to happen, it would immediately prove fatal by the unavoidable compression and injury of the spinal marrow.

An anchylosis, however, has been observed between the occiput and the atlas, attended with a change in their relative position and a lessening of the foramen magnum. A preparation of this kind is preserved in the Museum of Natural History at Paris. Levéillé conceives, that it must be this specimen, of which mention is made in the writings of Duverney and Bertin, and that the case originated from some chronic disease. (*Nouvelle Doctrine Chirurgicale, Tom.* 2, *p.* 60.)

### DISLOCATIONS OF THE FIRST CERVICAL VERTEBRA FROM THE SECOND.

Every surgeon is aware, that the rotatory motion of the head is chiefly performed by the first vertebra moving on the second. When this motion is forced beyond its proper limits, the ligaments which tie the processus dentatus to the edges of the foramen magnum are torn, and, supposing the head to be forced from the left to the right, the left side of the body of the vertebra is carried before its corresponding articulating surface, while the right side falls behind its corresponding surface. Sometimes the processus dentatus, whose ligaments are ruptured, quits the foramen formed for it by the transverse ligament and the anterior arch of the first vertebra, and presses on the spinal marrow. In other instances the processus dentatus does not leave its natural situation; but the diameter of the vertebral canal is always diminished at this place, and the spinal marrow consequently compressed, and otherwise injured. Patients can hardly be expected to survive mischief of this kind in so high a situation; indeed, they are frequently killed almost instantaneously.

According to surgical writers, the causes, which may produce this formidable accident, are various: a fall on the head from a high place; the fall of a heavy body against the back of the neck; a violent blow; a forcible twist of the neck; tumbling; standing upon the head; the rash custom of lifting up children by the head, &c. M. Louis found that the first vertebra was dislocated from the second in the malefactors hanged at Lyons, at which place, the executioner used to give a sudden twist to the body, at the moment of its suspension.

Many dislocations of the cervical vertebræ do not prove fatal; but these occur at the third, fourth, fifth, or sixth of these bones, and only one articular process is luxated. In these instances the vertebral canal is not so much lessened as to compress the spinal marrow, and occasion death.

If the luxation produce no symptom, which indicates a compression of the spinal marrow, it is prudent to abstain from all attempts at reduction. When the symptoms are urgent and alarming, and some attempt to relieve the patient is the only chance he has of living, we are to begin by inclining the head to the side towards which it is directed, in order to disengage the articulating process of the upper vertebra: this part of the operation is extremely dangerous, as it may instantly produce death by increasing the pressure on the spinal marrow. When the process is disengaged, the head and neck are brought to their right direction, by making them perform a rotatory motion the contrary of that, which has taken place in the luxation. A relapse is to be prevented by keeping the head and neck perfectly motionless. (*Boyer.*)

There can be no doubt of the rationality of attempting an immediate reduction of the processus dentatus, if signs of life should exist. This process is thrown back, so as to compress or injure the spinal marrow, while the atlas and the head itself are thrown forward. The recollection of these circumstances will enable a surgeon to do what is proper, better than any detailed directions.

A mother brought her child to Desault, with its neck bent, and its chin turned towards the right shoulder. The accident had been a consequence of the head having been fixed on the ground, while the feet were up in the air. A surgeon happened to be with Desault at the time, and they agreed to make an attempt to reduce the luxation, and to apprize the mother, that though the child might be cured, there was a possibility of its perishing under their hands. Being permitted to do what they judged proper, they fixed the shoulders, and the head was gently raised, and gradually turned into its natural position. The mother was rewarded for her courageous resignation; the child could now move freely; the pain ceased, and a considerable swelling in the situation of the luxation alone remained, and it was dispersed by the application of emollient poultices. (*Leveillé, Nouvelle Doctrine Chirurgicale, Tom. 2, p.* 62.)

Another alleged instance of the reduction of such a dislocation is also recorded by Dr. Settin in Schmucker's Vermischte Chirurgische Schriften. However, both in this case, and that related by Desault in his lectures, much doubt may be entertained, whether the accident were really such as it was supposed to be.

### DISLOCATIONS OF THE CLAVICLE.

These are much less common, than fractures, which are said to occur six times more frequently.

*The clavicle may be luxated at its sternal extremity*, forwards, backwards, and upwards, but never downwards, on account of the situation of the cartilage of the first rib. The luxation forward is the most frequent, and almost the only one ever met with. It may arise from the other end of the clavicle being forced very much backward. Dislocations backwards and upwards are very unusual. To cause the first sort of accident, the shoulder must have been violently driven forwards, and at the same time depressed with great force. The dislocation backward, is more rare, than the one upward.

If the dislocation be forwards, a hard circumscribed tumour is felt, or even seen, on the front and upper part of the sternum. When the shoulder is carried forward and outward, this tumour disappears, and, previously, there was a vacancy where the head of the clavicle ought to be.

When the luxation is upwards, the distance between the sternal ends of the clavicles is diminished.

When the dislocation is backwards, there is a depression where the end of the clavicle ought to be, and the head of the bone forms a projection at the front and lower part of the neck, which, as J. L. Petit remarks, may compress the trachea, œsophagus, jugular vein, carotid artery, and nerves. The head is inclined towards the side, on which the accident itself is situated.

In reducing these dislocations of the sternal end of the clavicle, we are to make a lever of the arm, by means of which the shoulder is brought outwards; and when thus brought outwards, it is to be pushed forwards, if the dislocation is in that direction; backwards, if the dislocation be behind; and upwards, if the dislocation be above.

It is as difficult to keep the bone reduced, as it is easy to reduce it, so smooth and oblique are the articular surfaces.

The same position of the arm, and the same apparatus, as in fractures of the clavicle, are to be employed. The end of the clavicle, however, can never be kept from rising a little, and this would be the case even were the tourniquet used, which was proposed by Brasdor, for making pressure on the end of the bone.

*The dislocation of the scapular end of the clavicle* from the acromion is much less common. The luxation upwards is almost the only one that ever occurs. It is possible, however, for the accident to take place downwards, and for the end of the clavicle to glide under the acromion. The rarity of dislocations of the scapular end of the clavicle, is owing to the strength of the ligaments tying the clavicle and acromion together.

A fall on the top of the shoulder may cause the dislocation upwards. The scapular end of the clavicle then slides upwards on the acromion, and the shoulder is drawn inwards by the muscles which approximate the arm to the body.

The violent action of the trapezius muscle, in pulling upward the clavicle, may tend to produce the accident.

Pain at the top of the shoulder, and a projection of the end of the clavicle, under the skin covering the acromion, are symptoms indicating what has happened. The patient also inclines his head to the affected side, and avoids moving his arm or shoulder.

This dislocation is reduced by carrying the arm outwards, putting a cushion in the axilla, and applying Desault's bandage for fractures of the clavicle, making such turns as ascend from the elbow to the shoulder, and press the luxated end of the bone downward, so as to keep it in its due situation. (See *Boyer's Leçons sur les Maladies des Os.*)

Most surgeons, in this country, would be content with applying a compress, the figure of 8 bandage, and supporting the arm in a sling.

### DISLOCATIONS OF THE OS BRACHII.

Nature, which varies according to the necessities of different animals, the number of their joints, has also been provident enough to vary the structure of these parts, according to the use of the different portions of their economy. To great moveableness some unite considerable solidity; for instance, the vertebral column. Others are very strong, but only admit of a slight yielding motion, as we observe in the carpus, tarsus, &c. Lastly, other joints admit of a great latitude of motion; but their strength is easily overpowered by the action of external bodies. Such are, in man, the shoulder-joint, and that between the sternum and clavicle.

The last kinds of articulation are particularly subject to dislocations, and, of all, not one is so often luxated as the shoulder-joint. Bichat mentions, that it appears, from a comparative table, that, in some years, this accident at the Hotel-Dieu, has been as frequent, and even more so, than dislocations of all the other bones taken collectively.

Here every thing seems to facilitate the escape of the bone from its natural cavity. An oval shallow cavity, surrounded by a margin of little thickness, receives a half-spherical head, which is twice as broad as the cavity in the perpendicular direction, and three times as extensive from before backward. With respect to the ligaments, the joint is only strengthened by a mere capsule, which is thin below, where nothing opposes a dislocation; but thicker above, where the acromion, coracoid process, and triangular ligament, form an almost insurmountable obstacle to such an accident. With regard to the muscles, and motions of this joint, strong and numerous fasciculi surround the articular surfaces, make them easily move in all directions, and pushing the head of the os brachii against the different points of the capsule, distend this ligamentous bag, and, when their power exceeds the resistance, actually lacerate it. As for external bodies, what bone is more exposed than the os brachii, to the effect of their force?

Thus subjected to the influence of these predisposing causes, the os brachii would be in continual danger of being dislocated, if the scapula, which is as moveable as itself, did not furnish a point of support for it, by accompanying its motions. This point of support accommodates itself to the variations in the position of the head of the os brachii, so that to the moveableness of the articular surfaces, their strength is, in a great measure, owing.

### DIFFERENT KINDS OF DISLOCATION.

The shoulder-joint, very liable to luxations in a general sense, is not equally so at all points. There are some, where a dislocation cannot occur; there are others, where, though possible, such an accident has never been observed. Hence, before examining the mechanism of dislocations of this joint, it is essential to determine with precision the directions in which they may take place. Here, indeed, authors differ in a very singular manner. Sometimes, they have employed different terms to express the same thing; and, sometimes, they have employed the same words to signify different things. Invariably agreed about certain kinds of dislocations, they entertain opposite sentiments concerning others; and, in the midst of these differences, the perplexed surgeon often cannot decide on what basis to found his practice.

### DIVISION ADOPTED BY AUTHORS.

The ancients, who knew very little of the natural relation of the parts surrounding the joint, were totally ignorant of the accidental relations, which such parts present in the case under consideration. Hence, no doubt, arose the confusion in their doctrines.

Many admitted four kinds of dislocations; many only three; some acknowledged only two; while others only allowed the possibility of one kind.

The first distinguished the different directions, in which the bone can be luxated. The dislocations were termed *upward, downward, forward,* and *backward.* Such was the opinion of the predecessors of Hippocrates, who, in informing us of it, demonstrates its inaccuracy. Others divided the dislocations of the shoulder into such as take place *downward, upward, outward,* and *forward.* This division is adopted by Galen, who, however, only cites an example of the luxation forward, and does not illustrate what he means by dislocations upward, and inward.

The second class of writers distinguished the species of dislocation, sometimes into those which occur *downward, forward,* and *backward.* Oribasius was one of these. Sometimes, they named the luxations *downward, outward,* and *inward.* Paul of Ægina followed this plan, and, no doubt, his meaning is the same as that of Oribasius, only expressed in different terms. Sometimes, they called the dislocations *downward, forward,* and *upward.* Albucasis did so, and thought the latter case exceedingly uncommon.

The third set believed, that when the head of the os brachii was displaced, it could only be carried *downward into the armpit,* a very common case; and *forward,* which is less frequently seen. Celsus is almost the only one, who has established this difference: he remarks, *Humerus modò in alam excidit, modo in partem priorem.*

Lastly, the fourth body of men only believed in the dislocation downward; which was the sentiment of Hippocrates, who had only seen this one sort of case in his practice. *At verò humerus inferiorem in partem excidit; aliam in partem excidere non audivi.*

The moderns borrowed from the ancients their divisions of dislocations of the shoulder-joint, and, at first, like their predecessors, they only determined in a vague manner the precise situations of these accidents. However, they afterwards fixed it with more determination, in proportion as they became enlightened by anatomy, and, in particular, took notice of the essential difference between primitive and consecutive luxations.

Petit admits four kinds of dislocations. 1. Downward on the inferior costa of the scapula, very rarely met with. 2. Outward, under the spine of this bone; a case, which as a primitive one, can only occur with difficulty. 3. Inward, into the armpit. 4. Forward, between the coracoid process and the clavicle. Heister, like this eminent practitioner, acknowledged four dislocations; but with a difference both of expression and meaning. One is downward, in the axilla; one forward, under the great pectoral muscle; another backward, under the scapula; and a fourth outward, under the spine of this bone. According to Duverney, primitive luxations never occur in any other direction than downward; the others being all the constant effect of muscular action.

### DIVISION ADOPTED BY DESAULT.

In the midst of these very confused ways of viewing a very simple subject, in is, in the first place, necessary, in order to have determinate ideas, to divide dislocations of the humerus into *primitive* ones, which are the sudden effect of external violence, and into *consecutive ones,* which follow the first, by the influence of causes, which will be investigated

Let the oval surface of the glenoid cavity be included within four lines; one representing its upper edge; another its lower; a third its inner edge; and a fourth its external one.

It is manifest, that the head of the humerus cannot be displaced towards the upper edge. There, are situated the acromion and coracoid process, the triangular ligament stretched between them, the tendons of the triceps, supra-spinatus, and the fleshy portion of the deltoid, insurmountable obstacles to the luxation of the head of the bone, propelled by any force upward. Besides, what power could this be? Supposing there were such a force, the head of the bone must necessarily be driven outward as well as upward, ere its head would be displaced. This is impossible, because the trunk prevents the lower part of the arm from being directed sufficiently inward to produce this effect.

On the contrary, at the other margins, there is little resistance. At the inferior one, the long portion of the triceps; at the internal one, the tendon of the subscapularis; and at the external edge, those of the infra-spinatus, and teres minor; are capable of easily yielding to any power directed against them, and of allowing primitive luxations to take place, downward, inward, or outward. Downward, between the tendon of the long portion of the triceps, and the tendon of the subscapularis; inward, between the fossa subscapularis, and muscle of this name; outward, between the fossa infraspinata, and infraspinatus muscle.

After being pushed out of its cavity, and first placed in one of these three directions, the head of the humerus often changes its position; and then, to primitive luxations, downward, or inward, a consecutive one succeeds. But, the latter could never follow the primitive dislocation outward, were this to exist; as the spine of the scapula would form an obstacle.

A consecutive luxation inward may succeed a primitive one downward: indeed, nothing resists the head of the humerus, in the course which it then follows to get between the fossa subscapularis and the muscle similarly named. On the contrary, should it tend outward, it is opposed by the tendon of the triceps, and notwithstanding what Petit has written, there is never a consecutive dislocation in this direction.

It sometimes happens, that, after the head of the bone has escaped from the internal or inferior part of the capsule, it is carried behind the clavicle, and then forms a consecutive dislocation upward; an event already noticed by Ambroise Paré, perhaps by Galen, and a specimen of which was preserved in Desault's museum. But, here, the secondary derangement only takes place slowly, and, when it occurs, it is almost always out of the power of art to rectify it, on account of the strong adhesions, contracted by the surfaces of the bone. Thus, in the instance to which allusion has been made, a new cavity was seen formed behind the clavicle, and the humerus adhered by new kinds of ligaments to the surrounding parts.

It follows, from what we have just been saying, that the humerus is subject to four kinds of dislocation. 1. Downward. 2. Outward. In these two directions the accident is always primitive. 3. Inward, which is sometimes primitive, sometimes consecutive. 4. Upward; a case which can never occur, except as a consecutive one.

The second and fourth cases are so very rare in comparison with the others, that these alone claim the practitioner's attention.

### CAUSES, &c.

These vary according as the dislocation is primitive, or consecutive.

### PRIMITIVE DISLOCATION.

The action of external bodies, directed against the arm; but, particularly, falls, in which this part is forced against a resisting body, gives rise to primitive dislocations, and then the different species of the accident are determined, by the particular position of the humerus at the instant, when the injury takes place.

Should this bone be raised from the side, without being carried either forward, or backward; should the elbow be elevated, and the fall take place on the side; then the weight of the trunk, almost entirely supported by this bone, forces downward its upper part, and this stretches and lacerates the lower part of the capsular ligament. Thus a luxation downward is produced, and its occurrence may also be facilitated by the combined action of the latissimus dorsi, pectoralis major, and teres major, muscles, as Fabre has judiciously remarked. Then, indeed, involuntarily contracted to support the trunk, these muscles act with the power of a kind of lever; in which operation the resistance is the head of the bone, which they draw downward, while the fixed point is the lower end of the bone, resting against the ground. Some authors also consider, as the immediate cause of a dislocation downward, the strong action of the deltoid, which then depresses the head of the bone, and pushes it downward out of the capsula. Certain observations seem incontestably to establish this mode of dislocation. Bichat mentions the well-known case of a notary, who luxated his arm downward, in lifting up a register.

The rationale of the primitive luxation inward differs very little from that of the preceding case. The elbow is both separated from the side, and carried backward: in falling, the weight of the body acts on the humerus, the front part of the capsule is lacerated, and a luxation takes place in this direction.

The dislocation outward is produced in the same sort of way. The elbow is carried forward, towards the opposite shoulder; the capsule is stretched outward, and if a sufficient force should act on the limb, is lacerated. But, how could such a force arise? In a fall, the arm pushed against the trunk, and kept there, could not move extensively enough to cause such a laceration. Hence, the luxation outward must necessarily be exceedingly rare. Indeed, there is no instance recorded of it in surgical books, and Desault in particular, never had occasion to observe such an accident. Besides, when, in a fall, the arm, raised from the side, is inclined forward or backward, the weight of the body only operates upon it obliquely, and the limb is very little exposed to the action of the latissimus dorsi, pectoralis major, and teres major muscles. No dislocation must occur more frequently, than that downward, in which the influence of both these causes is direct. The luxation inward, however, is very common, and a multitude of cases, which occurred to Desault confirm this kind of primitive dislocation, doubted by several modern authors, who are of opinion, with Hippocrates, that all dislocations at first take place downward.

The capsule may only be stretched in a primitive luxation, and then the articular surfaces only lose their relations imperfectly: but, most frequently, it is lacerated, and the head of the bone passes through the rupture. Authors have, in general, paid too little attention to this circumstance, which dissections have repeatedly demonstrated to practitioners, and to Desault in particular. This eminent surgeon had two specimens made of wax; one, of a dislocation inward; the other of one downward; both of which were met with in subjects, who died at the Hôtel Dieu. Bell also makes mention of similar facts, and another English surgeon, says Bichat, has observed the same occurrence. I suppose Bichat here alludes to Mr. Thompson, who long ago noticed the laceration of the capsule, and particularly called the attention of surgeons to the subject, in the Medical Observations and Inquiries.

Here the same thing often happens, which is seen to occur in compound fractures, in which the ends of the broken part protrude through the skin. The capsule is sufficiently torn to let the head of the bone escape; but, the opening, afterwards being too narrow, forms a kind of constriction round the neck of the humerus, so as to prevent the return of the head of the bone into the place, which it originally occupied. Thus, in the fractures, of which we have just been speaking, the opening of the skin will not allow the end of the fracture to be reduced, without a previous dilatation of the wound.

In this state, should we endeavour to reduce the dislocation, the capsule being pushed against the glenoid cavity, becomes compressed between it and the head of the bone, which the surgeon now in vain attempts to reduce. Desault, was the first who noticed this practical fact, two examples of which are recorded in his journal, and cases of which have since very often presented themselves at the Hôtel Dieu. In these cases, the head is commonly very moveable, because, being entirely on the outside of the capsule, nothing restrains its motions.

### CONSECUTIVE DISLOCATION.

When a consecutive luxation follows a primitive one, several causes may concur in producing it. If a fresh fall should happen, while the arm is separated from the trunk, the head of the humerus, which nothing confines, obeys, with the utmost facility, the power displacing it in this manner, and is again pushed out of the situation, which it accidentally occupies.

A man in going down stairs, meets with a fall, and dislocates the humerus downward; he immediately sends for Desault, who defers the reduction till the evening. In the mean time, the patient in getting upon a chair, slips and falls again. The pain was more acute, than when the first accident occurred, and Desault, on his return, instead of finding the head of the humerus as it was in the morning, in the hollow of the axilla, finds it behind the pectoralis major muscle.

The action of muscles is a permanent cause of a new dislocation. When the humerus, indeed, is luxated downward, the pectoralis major, and the deltoid draw upward, and inward, the upper part of this bone, which, only making a weak resistance to their action, changes its position, and takes one in the above double direction.

The various motions imparted to the arm, may also produce the same effect, according to their direction. Thus a luxation inward has often been observed to follow one downward, in consequence of unskilful efforts to reduce the latter.

### SYMPTOMS.

The diagnosis of dislocations of the humerus is, in general, attended with no difficulties.

Whatever may be the mode and situation of the dislocation, there always exists, as Hippocrates has remarked, a manifest depression under the acromion, which forms a more evident projection, than in the natural state. Almost all the motions of the arm are painful; some cannot be performed at all; and they are all very limited. The arm cannot move without the shoulder moving also, because the articulation being no longer able to execute its functions, both it and the shoulder form, as it were, one body.

To these symptoms, generally characteristic of every sort of dislocation of the humerus, are to be added such as are peculiar to each particular case. When the luxation is downward, the arm is a little longer, than in the natural state; it is capable of being moved a little outward: but, an acute pain is the inevitable consequence of moving it either forward, or backward. The elbow is more or less removed from the axis of the body, by the action of the deltoid, the long head of the biceps, and supraspinatus muscles, which, being stretched, contract and tend to draw the bone outward. The pains, which result from this position, compel the patient, in order to avoid them, to lean towards the side, on which the dislocation is, to keep the forearm half bent, and the elbow supported on his hip, in such a way, that the arm, having a resting place, may be sheltered from all painful motion, and stretching of the muscles. By this posture alone, Desault was in the habit of detecting a luxation downward, and his diagnosis was seldom found to be erroneous. Thus, in a fracture of the clavicle, the leaning posture of the patient is often, at the first glimpse, characteristic of the accident. In the axilla, there is constantly a more or less evident prominence, formed by the head of the humerus.

With the general symptoms of dislocations of the humerus, that inward has the following: the elbow, separated from the axis of the body, is inclined a little backward; the humerus seems to be directed towards the middle of the clavicle; motion backward is not very painful, but that forward is infinitely so; there is a manifest prominence under the great pectoral muscle; the arm is very little longer than in the natural state; and the posture is the same, as in the foregoing case.

If there should be a dislocation outward, it would be particularly characterized by a hard tumour under the spine of the scapula; by the direction of the elbow forward; by its separation from the trunk; and by the somewhat increased length of the arm.

A projection behind the clavicle; a manifest shortening of the arm; and its direction; would clearly denote a dislocation upward.

The symptoms, distinguishing the nature of dislocations of the humerus, do not always present the same degree of certainty, as those announcing the existence of such an accident. Often nothing is more difficult, than to determine, whether the case is a primitive dislocation inward, or a consecutive one; the same phenomena being observable in both cases. An accurate history of the case, by representing the order in which such phenomena occurred, can alone throw light on this point, which is the more interesting, as in the two cases, the means of reduction should vary. In the first, the head of the bone returns, through a short track, into its natural cavity; in the second, it has to traverse a much greater distance to arrive there.

If, as Petit has pretended, there are dislocations backward, sometimes primitive, sometimes consecutive, this remark would be equally applicable to them.

Some analogous symptoms, between dislocations of the humerus, the fracture of its neck, and luxations of the scapular end of the clavicle, might here create some uncertainty, if, in the latter case, the absence of a tumour in the arm-pit, and of a depression under the acromion, did not prevent an error, which, Hippocrates says, may be easily made; into which, Galen states, the masters of the art fell; and which Paré cautions us to avoid. Uncertainty might arise, if in the fracture of the neck of the humerus, the proper symptoms of a fracture did not prevent a most detrimental mistake, which the occasional direction of the humerus, and a kind of prominence, formed by the lower end of the fracture in the axilla, might cause. (See *Fracture of the Neck of the Humerus.*)

Inflammatory symptoms seldom follow dislocations of the humerus. Many authors, particularly B. Bell, speak of an œdematous swelling of the whole upper extremity, as a very common consequence of a dislocation inward, and it is referred to the compression of the axillary glands. Experience has not often demonstrated this occurrence at the Hôtel Dieu, except in very old luxations; and when the thing has occurred, very beneficial effects have been obtained, in certain instances, by applying, for a few days, a moderately tight bandage from the fingers up to the axilla, after the reduction has been accomplished. Bichat relates a case, in which the œdema did not disappear with the cause, but even rather increased; but the day after a bandage had been applied, the swelling was found diminished by one half.

There is another consequence, to which authors have paid but little attention; but, it was known to Avicenna, and was several times observed by Desault. This is a palsy of the upper extremity, arising from the pressure, made by the head of the bone, dislocated inward, upon the axillary plexus of nerves. This consequence sometimes resists all the means of art, as Bichat proves by a case, which he relates.

The affection is very difficult of cure, when the nerves have been a long time compressed. Desault several times applied the moxa above the clavicle. The success, which he first experienced on some patients, did not follow invariably in others.

But, when the head of the humerus has only made, as it were, a momentary pressure on the nerves, and the reduction has been effected, soon after the appearance of the symptoms, the paralytic affection often goes off of itself, and its dispersion may always be powerfully promoted by the use of volatile liniments.

### OF THE REDUCTION.

We may refer to two general classes, the infinitely various number of means, proposed for the reduction of the dislocated humerus. The first are designed to push back, by some kind of mechanical force, the head of the bone, into the cavity from which it is displaced, either with, or without making previous extension. The others are merely intended to disengage the head of the bone from the place which it accidentally occupies, leaving it to be put in its natural situation by the action of the muscles.

By the first means, art effects every

thing; by the second, it limits its interference to the suitable direction of the powers of nature. In the first method, the force externally applied always operates on the bone in the diagonal of two powers, which resist each other at a more or less acute angle; in the last, the power is only in one direction.

Here it is only necessary to state, that all the means, intended to operate in the first way, act nearly in the following manner. Something, placed under the axilla, serves as a fulcrum, on which the arm is moved as a lever, the resistance being produced by the dislocated head of the humerus, while the power is applied either to the lower part of this bone, or the wrist. The condyles of the humerus being pushed downward and inward, the head of the bone is necessarily moved in the opposite direction, towards the glenoid cavity, into which it slips with more or less facility.

Thus operated the machine, so celebrated among the ancients and moderns, under the name of the ambi of Hippocrates; whether used in the form described by this father of medicine, or with the numerous corrections devised by Paul of Ægina, Ambroise Paré, Duverney, Freke, &c. By this machine, a double motion is communicated to the head of the humerus, as above explained.

The extension usually moves the bone from its unnatural situation, and is executed in different ways. Sometimes, the weight of the body on one side, and the dragging of the end of the dislocated bone on the other, tend to produce this effect. Such was the action of the ladder, door, &c. described in Hippocrates's Treatise on Fractures, and repeated in modern works. Sometimes, the trunk is fixed in an unchangeable manner, while the arm is powerfully extended, as is practised in employing the machine of Oribasius, and was one of the methods formerly adopted in the public places, where wrestlers combated.

Sometimes, no extension is sensibly executed, and while the end of the humerus is pushed outward by a body placed under the axilla, the surgeon pushes it upward into the glenoid cavity.

We shall not here inquire into the inconveniences peculiar to each of these methods. Petit and B. Bell have already done so. We shall only point out the objections, common to all of them.

The exit of the head of the bone, through the lacerated capsule is not necessarily attendant on the dislocation. Nor is it even possible to know with precision the situation of this opening. Why then should we make use of an artificial force to direct the head of the bone towards this opening?

However covered the body placed under the axilla may be, to serve as a fulcrum, there is always a more or less inconvenient chafing, frequently dreadful stretching and laceration of parts, in consequence of its application, when the trunk is suspended upon it, as in the instance of the door, &c. In this way, Petit has seen a fracture of the neck of the humerus produced, and even a laceration and aneurism of the axillary artery.

Few surgeons have ready at hand the different kinds of apparatus. Hence, trouble and loss of time in getting them; time, which is of so much moment in the reduction; this being always the more easy, the sooner it is accomplished.

When the luxation is consecutive, how can mechanical means bring back the head of the bone, through the track it has taken? For instance, if to a dislocation downward one inward has succeeded, the head of the bone must necessarily be brought down, before it can be replaced in its cavity. The above artificial means often act repugnantly to the action of the muscles, which is a chief and essential agent in the reduction.

If the dislocation should be upward, they would obviously be ineffectual.

Perhaps, however, they might be advantageously employed, when a primitive luxation downward is quite recent, and when the head of the bone is very near its cavity. Then the inferior costa of the scapula presents an inclined plane, along which the end of the bone can easily glide, when propelled by any kind of external force. No doubt, it is to this tendency of the head of the bone to be replaced, that we must attribute the success, certainly exaggerated, but in part real, on which the inventor of such machines endeavours to establish the superiority of his plan.

But, in this case, it is useless to multiply artificial powers, when natural means suffice, and when we can accomplish the reduction with the hands more effectually, because we can vary the motions with more precision.

Thus Desault very often employed the following method with great success. The patient being seated upon a chair of moderate height, he took hold of the hand on the affected side, placed it between his knees, which he moved downward and backward, in order to make the extension and disengage the head of the bone, while an assistant held back the trunk to effect the counter-extension. This was sometimes executed by the weight of the body, and effort of the patient. At the same time, the surgeon's hands applied to the arm, in such a way, that the four fingers of each were put on the hollow of the axilla, and the thumbs on the outer part of the arm, pushed upward, and a little outward, the head of the humerus, which usually returned with ease into its natural cavity.

Petit explains this plan, though not as here described, but complicated with the use of a napkin, passed under the patient's axilla, and over the surgeon's neck, who contributes to raise the dislocated end of the bone, by lifting up his head. This accessory method is always useless, and little methodical, preventing, also, such variation of the motions, as one may wish. The hands alone are always sufficient, and a multitude of instances attest the efficacy of this method, employed in Desault's way.

When the luxation downward has been very recent, Desault has, two, or three times, succeeded in reducing it, by a still more simple process. Marie-Louise Favert fell in going down stairs, dislocated her arm downward, and was conveyed, immediately after the accident, to the Hôtel-Dieu. Desault having recognized the disorder, placed his left hand under the axilla, to serve as a fulcrum, while with the right, applied to the lower and outer part of the arm, he depressed the humerus towards the trunk, and at the same time raised the upper part of the bone. The head of the humerus directed upward and outward by this double motion, returned into the glenoid cavity, without the least resistance. The arm was placed in a sling for two days, and, on the fourth, the patient resumed her wonted labour.

Dislocations downward are not the only ones, to which the first of the above simple plans is applicable. Primitive luxations inward sometimes yield to its adoption. Two examples of such success are to be found in the *Journal de Chirurgie.*

### REDUCTION BY EXTENSION ALONE.

For the most part, however, such means are inadequate, and extension must be made. This employed alone, forms a second sort of means for reducing dislocations of the shoulder, and a few practitioners have deviated from the beaten path, and tried this latter plan. Celsus had recourse to nothing but extension in the ordinary cases of dislocation downward and forward. Albucasis was acquainted with no other mode. Douey, Douglas, and Heister, among the moderns, have absolutely rejected the use of machines, as always useless, and frequently dangerous. Lastly, Dapoui and Fabre examined with more exactness the process of extension, pointed out the manner of rendering it most advantageous in all cases, by the proper application of the extending force; and, in the dislocation of the humerus in particular, they obviated the inconvenience of pulleys, placed under the arm-pit on the affected side, shewing that the motion, vulgarly termed, coaptation, was of no utility. In these respects, the art is indebted to them for real improvement, and their doctrine, now universally diffused, was principally put into practice by Desault, who made it the base of his method of reducing all fractures, and dislocations in general.

To reduce a dislocation of the humerus, it is necessary to have a sufficient number of assistants, in order to increase the power according to the resistance which is to be overcome. But, two are usually sufficient for making the extension: in doing which, one should employ a linen pad, of sufficient thickness to project above the level of the pectoralis major, and latissimus dorsi. There must also be two bandages; one made of linen, several times doubled, four inches wide, and eight or nine feet long; the other being a towel, folded in the same way, and which is often unnecessary.

The patient is to sit on a chair of moderate height, or else he may lie down upon a table, which is firmly fixed, and covered with a mattress.

Desault, for a long while, used to put the patient in the first of these positions, which, though generally employed in practice, is not the best. In it the arm may be advantageously drawn in a transverse direction; but if, as is often the case, there be occasion to make extension upward or downward, the assistant is then obliged to rise up, and depress himself, has not sufficient power, finds himself obstructed, and cannot vary, at the pleasure of the surgeon, the direction in which the arm is to be extended. This position is also much more fatiguing to the patient, than one in which the trunk is equally supported upon a horizontal plane. Hence, Desault, in the latter years of his practice, abandoned the first position, and invariably adopted the last.

The patient being put in the proper position, the linen compress is to be put under the axilla, on the side affected, and upon this compress the middle of the first extending bandage is to be put, while its two heads ascending obliquely before and behind the chest, meet each other at the top of the sound shoulder, and are held there by an assistant, so as to fix the trunk, and make the counter-extension. The action of this bandage does not affect the margin of the pectoralis major and latissimus dorsi, in consequence of the pad projecting higher than them. If this were not attended to, these muscles being drawn upward, would pull in this direction the humerus, to which they are attached, and would thus destroy the effect of the extension, which is to be made in the following manner :—

Two assistants take hold of the fore-arm, above the wrist; or else the towel, doubled several times, is to be applied to this part. The two ends are to be twisted together, and held by one or two assistants, who are to begin pulling in the same direction in which the humerus is thrown. After this first proceeding, which is designed to disengage the head of the bone from its accidental situation, another motion is to be employed, which differs according to the kind of luxation. If this should be downward, the arm is to be gradually brought near the trunk, at the same time that it is gently pushed upward. Thus, the head of the bone being separated from the trunk, and brought near the glenoid cavity, it usually glides into this situation with very little resistance.

When the luxation is inward, after the extension has been made in the direction of the humerus, the end of this bone should be inclined upward and forward, in order that its head may be guided backward; *vice versâ*, when the luxation is outward.

When the head of the bone has been disengaged by the first extension, the motion imparted to it by the rest of the extension, should in general be exactly contrary to the course which the head of the bone has taken, after quitting the glenoid cavity. When there is difficulty experienced in replacing the head of the bone, we should, after making the extension, move the bone about in various manners, according to the different direction of the dislocation, and the principle just noticed. This plan often accomplishes what extension alone cannot; and the head of the bone, brought by such movements towards its cavity, returns into it, while they are being executed.

When the dislocation is a consecutive one, it is the first extension, made in the direction of the displaced bone, which brings back its head to where it was primitively lodged, in order to act upon the bone afterwards, just as if the luxation were one of the primitive sort. Often it is only at the moment of the reduction, that it is possible to distinguish, whether a luxation is of one or the other kind. Indeed, as the reduction mostly takes place of itself, when the extension is properly made, if the head be situated consecutively inward, it is seen to descend along the internal part of the scapula, then to proceed to the lower part, and, lastly, to ascend towards the opening of the capsule, into which opening it returns.

When the extension is properly made, the reduction is almost spontaneously effected. Indeed, whatever may be the kind of primitive dislocation, it is clear, that the muscles on one side of the articulation must be put upon the stretch, while those on the other must be relaxed. Hence, a change must necessarily follow both in their directions and contractions, and also in the direction of these contractions. From this change the muscles, when they act, instead of drawing back the head of the bone towards the ruptured capsule, pull it in another direction, and thus produce a consecutive dislocation.

But, if by rectifying things, the extension should chance to restore to the muscles their former direction, then obeying their natural irritability, increased by the stretching of the extending power, they will bring back the head of the bone to the opening in the capsule, and oblige it to enter with much more certainty, than the efforts of the surgeon could do, who is always ignorant of the precise situation of this opening. On the contrary, if the extension, in consequence of not having been properly made, should not have restored to the muscles their natural direction, then the head of the bone will be drawn to some other point of the capsule, away from that which has been lacerated: and hence arise the very frequent difficulties attendant on the reduction of dislocated shoulders.

It follows from what has been said:—1. That all the art of treating dislocations, consists in giving a proper direction to the extending force. 2. That in general the coaptation is useless. 3. That reducing a dislocation does not consist in putting back the head of the bone into its cavity; but, in putting the muscles in a proper state for accomplishing this reduction, and that here, as every where else, art is only the handmaid of nature.

There are cases, however, in which the action of the muscles, being perverted by the oldness of the dislocation, and by the adhesions contracted with the surrounding parts, it becomes necessary to employ such means, as will serve to force, as it were, the head of the bone into its cavity, whither the muscles cannot bring it.

With reasoning is combined experience, which is always the most effectual proof of this doctrine, both respecting reductions of the dislocated humerus, and of such accidents in general. Desault only employed extension, variously diversified, till he had put the muscles in a state, favourable for accomplishing reduction. The most prompt success constantly crowned this part of his practice, and, doubtless, much of this success must be imputed to his wisely refusing to interfere in too great a degree.

When the reduction has been accomplished, if the arm should be very moveable, and seem to have a tendency to be dislocated again, it must be fixed, for a few days, in such a way as will prevent all motion.

A sling, well applied, suffices for this purpose; and, indeed, the arm should always be kept quietly supported in one, after a dislocation. The French apply the bandage, which Desault has recommended for the fractured clavicle.

### OF SOME CIRCUMSTANCES, RENDERING THE REDUCTION MORE DIFFICULT.

#### 1. *Narrowness of the opening of the Capsule.*

The opening of the capsule, being too narrow to allow the head of the bone to return into the glenoid cavity, is one of the chief impediments to reduction. The obvious indication is to enlarge such an opening, by lacerating its edges. This is fulfilled by moving the bone about freely, in every direction, particularly in that in which the dislocation has taken place. Now, by pushing the head of the bone against the capsule already torn, the latter becomes lacerated still more, in consequence of being pressed between two hard bodies. The reduction, which is frequently impracticable before this proceeding, often spontaneously follows, immediately after it has been adopted. In the *Journal de Chirurgie* are two cases, by Anthaume, and Faucheron, establishing this doctrine.

Mr. White, of Manchester, believed, that the reduction was sometimes prevented by the head of the bone not being able to get through the laceration in the capsule again. He succeeded in reducing some such cases in the following manner: having screwed an iron ring into a beam at the top of the patient's room, he fixed one end of the pulleys to it, and fastened the other to the dislocated arm by ligatures about the wrist, placing the arm in an erect position. In this way, he drew up the patient, till his whole body was suspended; but, that too much force might not be sustained by the wrist, Mr. White at the same time directed two other persons to support the arm above the elbow. He now used to try with his hands to conduct the arm into its place, if the reduction had not already happened, as was sometimes the case. Occasionally, a snap would be heard, as soon as the patient was drawn up; but, the reduction could not be completed, till he was let down again, and a trial made with the heel in the arm-pit. When no iron ring was at hand to suspend the patient from, Mr. White used to have the patient raised from the ground by three or four men, who stood upon a table. (*Cases in Surgery, by Charles White, F.R.S. p.* 95.)

#### 2. *Oldness of the Dislocation.*

This is a second impediment to reduction, still more difficult to surmount than the foregoing one. The head of the bone, which has lodged a long while in its accidental situation, contracts adhesions to it. The surrounding cellular substance becomes condensed, and forms, as it were, a new capsule, which resists reduction, and which, when such reduction cannot be accomplished, supplies, in a certain degree, the office of the original joint, by the motion which it allows.

The majority of writers, and Bell in particular, advise, in this case, that no attempt at reduction should be made, as it would be useless in regard to the dislocation, and might be injurious to the patient, from the excessive stretching of parts. This was for some time the doctrine of Desault; but, in his latter years, experience led him to adopt a bolder practice.

Complete success, obtained in dislocations, which had existed from fifteen to twenty days, encouraged him to attempt reduction at the end of thirty, and thirty-five days, and, in the two years preceding his death, he succeeded, three or four times in reducing dislocations which had existed two months and a half, and even three months, both when the head of the bone was situated at the lower, and at the internal part of the scapula.

However violent or protracted the extension may have been, none of the terrible consequences with which authors threaten us, ever occurred. One phenomenon, which it was difficult to foresee, and of which we shall speak presently, only took place in two instances.

In these cases it is necessary, before making the extension, to move the bone about extensively in all directions, for the purpose of first breaking its adhesions, lacerating the condensed cellular substance, serving as an accidental capsule, and of producing, as it were, a second dislocation, in order to remove the first. Extension is then to be made in the ordinary way, but with an additional number of assistants.

The first attempts frequently fail, and the dislocated head of the bone continues unmoved, notwithstanding the most violent efforts. In this case, after leaving off the extension, the arm is to be again moved about most extensively. The humerus is to be carried upward, downward, forward, and backward. Force the resistances. Let the arm describe a large segment of a circle, in the place where it is situated. Let it be once more rotated on its axis; then let the extension be repeated, and directed in every way. Thus, the head of the bone will be first disengaged by the free motion, and will afterwards be reduced.

In these cases, when the dislocation, in consequence of being very old, presents great obstacles in the way of reduction, even though the attempts made for this purpose should fail, they are not entirely useless. By forcing the head of the bone to approach the glenoid cavity, and even placing it before the cavity, and making it form new adhesions, after the destruction of the old ones, the motions of the arm are rendered freer. Indeed, they are always the less obstructed, the nearer the head of the bone is to its natural situation.

### 3. *Contractions of the Muscles.*

A third impediment to the reduction of every kind of dislocation, is the power of the muscles, which is augmented beyond the natural degree, in consequence of their being on the stretch. Sometimes, this power is so considerable, that it renders the head of the bone immoveable, though the most violent efforts are made. Here the means to be adopted are such as weaken the patient, bleeding, the warm bath, &c. Extension unremittingly, but not violently, continued for a length of time, will ultimately fatigue the resisting muscles, and overcome them with more safety and efficacy, than could be accomplished by any sudden exertion of force.

The swelling about the joint, brought on by the accident, usually disappears without trouble.

Another consequence, which seldom occurs in practice, concerning which, authors have scarcely said any thing, and which Desault several times had occasion to observe, is a considerable emphysema, suddenly originating at the time of reduction. In the middle of such violent extension, as the long standing of the dislocation requires, a tumour suddenly makes its appearance under the great pectoral muscle. Rapidly increasing, it spreads towards the arm-pit, the whole extent of which it soon occupies. preads backward, and, in a few minutes, sometimes becomes as large as a child's head. A practitioner, unacquainted with this accident, might take it for an aneurism, occasioned by the sudden rupture of the axillary artery, from the violent extension. But, if attention be paid to the elasticity of the tumour, to its fluctuation, to the situation where it first appears, commonly under the great pectoral muscle, and not in the axilla; to the continuance of the pulse; and to the unchanged colour of the skin; the case may easily be discriminated from any rupture of the artery. (*Œuvres Chirurg. de Desault, par Bichat, Tom.* 1.)

The saturnine lotion, and gentle compression with a bandage, are the most advantageous means for dispersing the above kind of swelling.

I shall conclude the subject of luxations of the shoulder with the following singular observation recorded by M. Larrey.

"Among the curious anatomical preparations, (says he) which I saw in the cabinet of the University of Vienna, there was a dissected thorax, shewn to me by Professor Prokaska, in which the whole orbicular mass of the head of the right humerus, engaged between the second and third true ribs, projected into the cavity of the chest. This singular displacement was the result of an accidental luxation occasioned by a fall on the elbow, while the arm was extended and lifted from the side. The head of the humerus, after tearing the capsular ligament, had been violently driven into the hollow of the axilla, under the pectoral muscles, so as to separate the two corresponding ribs, and pass between them. The diameter of the head of the bone surmounted this obstacle, and penetrated entirely into the cavity of the thorax, pushing before it the adjacent portion of the pleura. Every possible effort was made in vain to reduce this extraordinary dislocation. The urgent symptoms, which arose, were dissipated by bleeding, warm bathing, and antiphlogistic remedies. The arm, however, remained at a distance from the side, to which condition, the patient became gradually habituated, and, after several years of suffering and oppression, he at length experienced no inconvenience. The patient was about sixteen or seventeen, when he met with the accident; and he lived to the age of thirty-one, when he died of some disease, which had no concern with the dislocation. His physicians were anxious to ascertain the nature of this curious case, of which they had been able to form only an imperfect judgment. They were much surprised to find, upon opening the body, the head of the humerus lodged in the chest, surrounded by the pleura, and its neck closely embraced by the two ribs above specified. They were still more astonished to find, instead of a hard spherical body covered with cartilage, only a very soft membranous ball, which yielded to the slightest pressure of the finger. The cartilage and osseous texture of the whole portion of the humerus, contained within the cavity of the chest, had entirely disappeared. *Les absorbans s'en étaient emparés,* (says M. Larrey) *et comme autant de gardiens fidèles, ils avaient cherché à détruire par portions, n'ayant pu l'expulser en masse, un ennemi qui s'était furtivement introduit dans un domicile ou sa presence devait être importune et nuisible.* Of the humerus, there only remained some membranous rudiments of its head, and a great part of these seemed to belong to the pleura costalis." (See *Larrey's Mémoires de Chirurgie Militaire, Tom.* 2, *p.* 405—407.)

### DISLOCATIONS OF THE FORE-ARM FROM THE HUMERUS.

Notwithstanding the extent of the articular surfaces of the radius and ulnar with the os humeri, the strength of the muscles and ligaments surrounding the joint, and the mutual reception of the eminences, which makes it a perfect angular ginglymus, a dislocation of these two bones off the humerus, may take place at the same time. They are most frequently luxated backward; sometimes laterally, but very rarely forward: the latter luxation cannot occur without a fracture of the olecranon. Indeed, it is so uncommon, that neither Petit nor Desault ever met with it. The luxation backwards is facilitated by the small size of the coronoid process, which may slide behind the humerus, when this is forciby pushed downwards and forwards, and ascend as high as the cavity, which receives the olecranon during the extension of the fore-arm.

Luxations laterally are much less frequent, and are always incomplete. The great extent of the articular surfaces in the transverse direction, the reciprocal union of their inequalities, and especially the strength of the ligaments and muscles, which, arising from the internal and external condyles of the inferior extremity of the humerus, go to the fore-arm and hand, give great strength to the articulation, and render it impossible to effect by any violence, a complete luxation laterally.

In the luxation backwards, the radius and ulna may ascend more or less behind the humerus; but the coronoid process of the ulna is always carried above the articular pulley, and is found lodged in the cavity destined to receive the olecranon. The head of the radius is placed behind and above the external condyle of the humerus. The annular ligament, which confines the superior extremity of the radius to the ulna, may be lacerated: in which case, even when the bones are reduced, it is difficult to keep them in their proper places, as the radius tends constantly to quit the ulna.

This luxation always takes place from a fall on the hand; for, when we are falling, we are led by a mechanical instinct to bring our hands forwards to protect the body. If in this case the superior extremity, instead of resting vertically on the ground, be placed obliquely with the hand nearly in a state of supination, the repulsion which it receives from the ground will cause the two bones of the fore-arm to ascend behind the humerus, whilst the weight of the body pressing on the humerus, directed obliquely downwards, forces its extremity to pass down before the coronoid process of the ulna.

The fore-arm, in this luxation, is in a state of half-flexion, and every attempt to extend it occasions acute pain. The situation of the olecranon, with respect to the condyles of the humerus, is changed. The olecranon, which, in the natural state, is placed on a level with the external condyle, which is itself situated lower than the internal, is even higher than the latter.

This luxation may be mistaken for a fracture of the olecranon, of the head of the radius, or even of the inferior extremity of the humerus. Such a mistake is attended with very bad consequences; for, if the reduction be not effected before the end of fifteen or twenty days, it is often impossible to accomplish it afterwards. The swelling which supervenes in twenty-four hours after the accident, renders a diagnosis more difficult; but the olecranon and internal condyle, are never so obscured, that the distance between them cannot be found to be increased, though Boyer makes a contrary assertion. It is true, that the rubbing of the coronoid process and olecranon against the humerus, may cause a grating noise, similar to that of a fracture; and some attention is certainly requisite to establish a diagnosis between a fracture of the head of the radius, and a dislocation of the fore-arm backwards.

The following method of reducing the case is advised by Boyer:—The patient being firmly seated, an assistant is to take hold of the middle part of the humerus, and make the counter-extension, while another assistant makes extension at the inferior part of the fore-arm. The surgeon, seated on the outside, grasps the elbow with his two hands, by applying the fore-fingers of each to the anterior part of the humerus, and the thumbs to the posterior, with which he presses on the olecranon, in a direction downwards and forwards. This method will be in general successful. If the strength of the patient, or the long continuance of the luxation, render it necessary to employ a greater force, a towel is to be applied on the wrist, to make extension, and a cushion is to be placed in the axilla, and the arm and trunk fixed, as is done in cases of luxation of the humerus.

A bandage may afterwards be applied, in the form of a figure of 8, and the arm is to be kept in a sling. The laceration which always takes place, is invariably followed by more or less swelling, which is to be combated by antiphlogistic means.

At the end of seven or eight days, when the inflammatory symptoms are nearly gone, the articulation is to be gently moved, and the motion is to be increased every day, in order to prevent an anchylosis, to which there is a great tendency.

In this luxation, the annular ligament which confines the head of the radius to the extremity of the ulna, is sometimes torn, and the radius passes before the ulna. In such cases pronation and supination are difficult and painful, though the principal luxation has been reduced. The head of the radius may be easily replaced, by pressing it from before backwards, and it is to be kept in its place by a compress, applied to the superior and external part of the fore-arm The bandage and compresses are to be taken off every two or three days, and re-applied. This is necessary, on account of the necessity of moving the articulation to prevent an anchylosis.

If the luxation be not soon reduced, it becomes irreducible; the heads of the radius and ulna grow to the back part of the humerus, and the patient can neither bend nor extend his arm. However, in certain cases, especially in young persons, some motion is acquired in time; the heads of the radius and ulna making in the humerus cavities, in which they perform some motions, but always imperfectly.

The luxation forwards should be treated as a fracture of the olecranon, with which it would be inevitably accompanied. It may be necessary, on account of the great injury done to the soft parts, to bleed the patient copiously, and put him on an antiphlogistic regimen.

As to the lateral luxations, either inwards or outwards, they are always incomplete, and easily discovered. They are reduced by drawing the humerus and fore-arm in contrary directions, and at the same time pushing the extremity of the humerus, and the two bones of the fore-arm in opposite directions.

These luxations cannot be produced without considerable violence; but when the bones are reduced, they are easily kept in their place. It will be sufficient to pass a roller round the part, to put the fore-arm in a middle state, neither much bent nor extended, and to support it in a sling. But much inflammation is to be expected from the injury done to the soft parts. In order to prevent it, or at least mitigate it, the patient is to be bled two or three times and put on a low diet, and the articulation is to be covered with the lotio aq. litharg. acet. Boyer, however, has recommended emollient cataplasms. It is scarcely necessary to repeat, that the arm is to be moved as soon as the state of the soft parts will admit of it. (*Boyer's Leçons sur les Maladies des Os, Tom.* 2 )

The dislocation of the fore-arm backward, is said to occur ten times as frequently as lateral luxations; and those forward are so rare, that no comparison whatever can be drawn. (*Œuvres Chirurgicales de Desault par Bichat, Tom.* 1.)

Lateral luxations have been divided into *complete*, that is, when the articular surfaces have entirely lost their state of reciprocal contact; and into *incomplete*, that is, when only one bone, or a part of it, is thrown off the humerus. But, what cause can operate with sufficient force to produce the first occurrence? The mischief would also be so great, were such a case to happen, that amputation would most likely be requisite.

The incomplete lateral luxation may be produced by a blow, which drives the upper part of the fore-arm violently outward, or inward. A footman, says Petit, in falling from a coach, had his arm entangled in the spokes of a wheel, and a dislocation outward was the consequence. Another man luxated his fore-arm inward, by falling from his horse and driving his arm against an uneven place.

When the ulna is pushed into the situation of the radius, the space, between the olecranon and internal condyle, is much greater, than is natural. These points of bone are always very distinguishable, let the joint be ever so much swollen; and hence, the information to be derived from an examination of them, may be obtained in every case, without exception. Also, when the ulna is pushed into the place of the radius, the latter bone cannot be easily rotated, nor can the fore-arm be bent, and extended, in a perfect manner.

The dislocation inward must be very uncommon, as the form of the bones is almost an insurmountable obstacle to such an accident. It may happen, however, as the authority of Petit confirms.

All recent dislocations of the elbow are very easily reduced, and as easily maintained so; for the reciprocal manner in which the articular surfaces receive each other, and their mutual eminences and cavities, will not readily allow the bones to become displaced again.

The application of a bandage in the form of a figure of 8, and supporting the arm in a sling, are proper in all these cases.

### DISLOCATION OF THE RADIUS FROM THE ULNA.

The majority of authors, who have written on dislocations of the fore-arm, have not separately considered those of the radius. Some detached observations, on luxations of its superior extremity, are to be found here and there; a subject, which Duverney alone has fully treated of. The dislocations of its lower end, which are more frequent, and easy of occurrence, have almost escaped the notice of French, and, also, English writers.

At present, cases of this sort have been so numerously collected, that a particular account of them may be offered.

### DIFFERENCE OF STRUCTURE, BETWEEN THE TWO JOINTS OF THE RADIUS WITH THE ULNA.

The radius, the moveable agent of pronation and supination, rolls round the ulna, which forms its immoveable support, by means of two articular surfaces; one above, slightly convex, broad internally, narrow outwardly, and corresponding to the little sigmoid cavity of the ulna, in which it is lodged; the other below, concave, semicircular, and adapted to receive the convex edge of the ulna. Hence, there are two joints, differing in their motions, articular surfaces, and ligaments. By ascertaining such differences, we shall be enabled to find out those, which exist between the luxations of the upper and lower head of the radius.

Above, the radius, in pronation and supination, only moves on its own axis; below, it rolls round the axis of the ulna. Here, being more distant from the centre, its motions must be both more extensive and powerful, than they are above. The head of the radius, turning on its own axis in the annular ligament, cannot distend it in any direction. On the contrary, below, the radius, in performing pronation, stretches the posterior part of the capsule, and presses it against the immoveable head of the ulna, which is apt to be pushed through, if the motion be forced. A similar event, in a contrary sense, takes place in supination. The front part of the capsule, being rendered tense, may now be lacerated.

Add to this disposition, the difference of strength between the ligaments of the two joints. Delicate, and yielding, below; thick, and firm, above; their difference is very great. The upper head of the radius, supported on the smaller immoveable articular surface of the ulna, is protected from dislocation in most of its motions. On the contrary, its lower end, carrying along with it, in its motions, the bones of the carpus, which it supports, cannot itself derive any solid stability from them.

### DIFFERENCES OF DISLOCATIONS OF THE RADIUS.

From what has been said, the following conclusions may be drawn: 1. That with more causes of luxation, the lower articulation of the radius has less means of resistance; and, that under the triple consideration of motions, ligaments tying the articular surfaces together, and the relations of these surfaces to each other, this joint must be very subject to dislocation. 2. That, for opposite reasons, the upper joint cannot be very subject to such an accident.

Indeed, what could be the cause producing it in this situation? Can it arise from a violent pronation, or supination? The lower joint being the weakest, would give way the first, and, however forcible any motion of this kind might be, the upper head of the radius would only be rotated on its own axis. How then can this part be dislocated, without being pushed forward, or backward? All the muscular and ligamentous support of the joint must be broken; and the muscles and ligaments are too strong to admit of this, and the motion itself too feeble. Can the accident originate from any impulse on the radius, from below upward? The immoveable resisting end of the humerus would then prevent the radius from quitting the capsular ligament. Can the accident arise from a violent extension, or flexion of the fore-arm? Here the whole force operating on the ulna, the radius scarcely feels the impulse.

Hence, accidental dislocations of the radius, suddenly produced by an external cause, must, if they ever happen, be exceedingly uncommon at its upper end. This is not the case, with respect to such dislocations, as occur slowly at this joint, especially in children, in whom the ligaments become lax in consequence of repeated efforts. With this kind of case, we have here nothing to do.

Experience sometimes seems to militate against the above reflections. Duverney quotes some instances of dislocations of the radius, suddenly produced by external causes. Some other practitioners mention similar examples. But, in their examinations, have these authors paid all due attention? An analogous case has been transmitted to the French Academy of Surgery, by one of its fellows; but, doubts have arisen concerning its reality, and there are too few facts for, and too much presumptive evidence against, the truth of such cases, for their existence to be believed. Desault himself rejected their reality.

### DISLOCATION OF THE LOWER END OF THE RADIUS.

The causes are the same, as those of all analogous cases. 1. Violent action of the pronator and supinator muscles. This is, doubtless, a very unusual cause, for Desault never knew an instance of it. 2. External force, moving the radius violently into a state of pronation, and rupturing the back part of the capsule; or into a state of supination, and breaking the front part of the capsular ligament.

Hence, there are two kinds of dislocation; one forward, the other backward. The first is very frequent; the second is much less so. The latter case never presented itself to Desault, but once, in the dead body of a man, who had both his arms dislocated, and no particulars could be learnt. The other case occurred very often in the practice of this eminent surgeon. Five examples have been published. Doubtless, this difference is owing to all the principal motions of the radius being in the prone direction.

This observation is confirmed by the fact, that the lower joint of the radius, in the dead subject, may be dislocated as easily by a supine, as a prone motion of this bone.

The symptoms of the luxation forward are; 1. Constant pronation of the fore-arm; 2. An inability to perform supination, and great pain on this being attempted; 3. An unusual projection at the back of the joint, in consequence of the protrusion of the little head of the ulna through the capsule; 4. The position of the radius is more forward, than natural; 5. Constant adduction of the thumb, which also is almost always extended; 6. A half-bent state of the fore-arm, and very often of the fingers. This, indeed, is the position, which the fore-arm usually assumes in all affections of its bones, and, in the present instance, the posture cannot be changed, without considerable pain; 7. More or less swelling around the joint. This sometimes comes on immediately after the accident, but always afterwards, if the reduction should remain unaccomplished. The condition of the joint may thus be obscured, and the accident mistaken for a sprain; as Desault often observed to have occurred with surgeons, who had been called to these accidents before him. The serious consequence of this mistake is, that no attempt at reduction is made, and the articular surfaces having time to contract adhesions, the disorder is frequently rendered irremediable.

A luxation of the radius backward is characterized by symptoms, the reverse of those above mentioned. They are, a violent supination of the limb; inability to put it prone; pain on making the attempt; a tumour in front of the fore-arm formed by the head of the ulna; a projection backward of the large head of the radius; and abduction of the thumb.

### REDUCTION.

When the dislocation is forward, an assistant is to take hold of the elbow, raising the arm a little from the body; another is to take hold of the hand and fingers.

The surgeon is to take hold of the end of the fore-arm with both his hands; one applied to the inside, the other to the outside, in such a manner, that the two thumbs meet each other before, between the ulna and radius, while the fingers are applied behind. He is then to endeavour to separate the two bones from each other, pushing the radius backward and outward, while the ulna is held in its proper place. At the same time, the assistant, holding the hand, should try to bring it into a state of supination, and consequently the radius, which is its support. Thus pushed, in the direction opposite that of the dislocation, by two powers, the radius is moved outward, and the ulna returns into the opening of the capsule, and into the sigmoid cavity.

If chance should present a dislocation of the radius backward, the same kind of proceeding, executed in the opposite direction, would serve to accomplish the reduction. (See *Œuvres Chirurgicales de Desault, par Bichat, Tom.* 1.)

### DISLOCATIONS OF THE WRIST.

The carpal bones may be luxated from the lower ends of the radius and ulna forwards, backwards, inwards, or outwards. The two first cases, especially the one backwards, are the most frequent. The dislocation backwards is rendered easy by the direction of the convex articular surfaces of the scaphoid, semilunar, and pyramidal bones, which sloping more backwards than forwards, must make them more disposed to slip in this direction, than any other. The accident may be caused by a fall on the back of the hand, while much bent; in which event the first row of the carpal bones slide backwards into the oblong cavity of the radius, lacerate the posterior ligament, and form an eminence behind the lower ends of the bones of the fore-arm. This prominence, the depression in front of the wrist, and the extraordinary flexion of the hand, which cannot be extended, are the characteristic signs of this kind of dislocation. The dislocation forwards generally arises from a fall on the palm, the fingers being extended, and more force operating on the lower, than upper part of the palm. The luxation is seldom complete; and the hand remains painfully extended. The great many tendons, which run before the wrist, and the annular ligament, being pushed forward, the prominence formed by the carpal bones, in front of the ends of the radius and ulna, is not easily detected, and the case may be mistaken for a sprain.

Dislocations inwards, or outwards, are never complete. The projection of the carpal bones at the inner, or outer side of the joint, and the distortion of the hand, make such cases sufficiently evident.

All dislocations of the wrist are very easy of reduction. For this purpose, gentle extension must be made, while the two surfaces of the joint are made to slide on each other in a direction contrary to what they took when the accident occurred.

Dislocations of the wrist are always attended with a great deal of spraining of numerous tendons, and laceration of ligaments, and consequently considerable swelling generally follows, and the patient is a long time in regaining the perfect use of the joint. To relieve the symptoms as much as possible, the best plan is to keep the hand and wrist continually covered with linen wet with the saturnine lotion, and to put the fore-arm and hand in splints, as in the case of a fracture. See *Fractures of the Fore-arm.* The arm must also be kept perfectly at rest in a sling.

When the ruptured ligaments have united, the use of liniments will tend to remove the remaining stiffness and weakness of the joint.

### DISLOCATIONS OF THE BONES OF THE CARPUS AND METACARPUS.

A dislocation of the carpal bones from each other seems almost impossible. The os magnum, however, has been known to be luxated from the deep cavity formed for it by the scaphoides and semilunare, in consequence of too great a flexion of the bones of the first phalanx on those of the second, and it formed a tumour on the back of the hand. (*Chopart; Boyer; Richerand.*)

### DISLOCATIONS OF THE FINGERS.

The first phalanges may be dislocated backwards off the heads of the metacarpal bones. A luxation forwards would be very difficult, if not impossible, because the articular surfaces of the metacarpal bones extend a good way forwards, and the palm of the hand makes resistance to such an accident. Only the first phalanges of the thumb and little finger can be dislocated inwards; and the first phalanx of the thumb is alone subject to be luxated outwards. This phalanx is also most liable to dislocations backwards, behind the head of the first metacarpal bone, in which case it remains extended, while the second is bent.

These dislocations should be speedily reduced; for, after eight or ten days, they become irreducible. In a luxation of the first bone of the thumb, which was too old to be reduced, Desault proposed cutting down to the head of the bone, and pushing it into its place with a spatula. Dislocations of the thumb and little finger inwards, that of the thumb outwards, and luxations of the first phalanges of the other fingers backwards, are all reduced by making extension on the lower end of the affected thumb, or finger. The first and second phalanges may also be dislocated backwards.

After the reduction, the thumb, or finger, affected, should be rolled with tape, and incased, and supported in pasteboard, till the lacerated ligaments have united; care being taken to keep the hand and fore-arm quietly in a sling.

### DISLOCATIONS OF THE BONES OF THE PELVIS.

M. Louis, in Tom. 4, of the *Mem. de l'Acad. de Chirurgie, 4to.* relates a case, in which the os ilium of the right side was found separated from the sacrum, so as to pass nearly three inches behind it. This accident was caused by a very heavy sack of wheat falling on a labourer, and the truth of it was ascertained by dissection. Such a case must be exceedingly uncommon.

The os coccygis is not so easily dislocated as fractured. Boyer, however, has seen it displaced in a man, who was greatly emaciated by disease. This subject had considerable ulcerations about the coccyx, and the bone itself was bare. There was an interspace of nearly two inches, between the sacrum and base of the os coccygis. In proportion as the man regained his strength the bone recovered its right position; and at length united to the os sacrum, notwithstanding the action of the levatores ani, which are inserted into it. (*Boyer.*) This case, however, was not an accidental luxation; and it clearly arose from the destruction of the ligaments by disease.

Authors mention two kinds of dislocation, to which the os coccygis is liable, one inward, the other outward. The first is always occasioned by external violence; the second, by the pressure of the child's head in difficult labours. The nature of these accidents is easily discovered by the preceding cause, and by an examination with the fingers, externally, and within the rectum. Pain, difficulty of voiding the fæces and urine, tenesmus, and inflammation, sometimes ending in abscesses, which interest the rectum, are symptoms, said to attend and follow dislocations of the os coccygis.

These luxations are easily reduced, by means of a finger in the rectum, assisted by the other fingers externally. No more can be done, than in the case of a fracture. (See *Fracture.*)

### DISLOCATION OF THE RIBS.

J. L. Petit was silent on this subject, as he thought such cases never occurred.

Since his death, a French surgeon, Buttet, has related an instance, which he supposed to be a dislocation of the posterior extremity of the rib from the vertebræ; but, Boyer clearly shews he had no true reasons for this opinion, and that the case was only a fracture of the neck, or end of the bone, near the spine.

Ambrose Paré, Barbette, Junker, Platner, and Heister, not only admit the occurrence of luxations of the ribs; but, describe different species of them. Lieutaud also termed cases, in which the head of the rib was separated by disease, luxations. On the whole, we may conclude, that the ribs are so rarely dislocated, that the subject is not deserving of much attention in this work.

### DISLOCATIONS OF THE THIGH-BONE.

The head of the thigh-bone may be dislocated upwards and outwards on the dorsum of the ilium; upwards and forwards on the body of the os pubis; downwards and inwards on the foramen ovale; and downwards and outwards on the os ischium.

The dislocation upwards and outwards, and the one downwards and inwards, are the most frequent. First, of luxations on the ilium.

The common kind of dislocation of the thigh-bone, upward and outward, is attended with the following symptoms. The affected thigh is shorter, than its fellow, is a little bent, and carried inwards. The knee inclines more forwards and inwards, than the opposite one; the leg and thigh are turned inwards, and the foot points in this direction. The trochanter major is brought nearer the anterior superior spinous process of the os ilium, and is at the same time elevated and carried a little forwards. The natural length of the limb cannot be restored, without reducing the luxation; the foot cannot be turned outwards, and any attempt to do so causes pain; but, the inclination of the foot inwards may be increased. (*Boyer.*)

This luxation has nothing in common with a fracture of the neck of the thigh-bone, except the shortness of the limb. The cases are at once discriminated by this difference, that, *in this kind of luxation, the limb and toes are turned inwards, while in all fractures of the thigh-bone, they are invariably turned outwards.*

Many writers have been puzzled how to account for the toes being inclined inwards. We have only to reflect, however, that the trochanter major is situated forwards, and that the head of the bone lies backwards, when we shall immediately perceive, that the limb is mechanically prevented from being rotated outwards.

To reduce this dislocation, the patient should be placed on his opposite side upon a table firmly fixed, or a large four-posted bedstead. A sheet, folded longitudinally, is first to be placed under the perineum, and one end being carried behind the patient, the other, before him, they are to be fastened to one of the legs, or posts of the bed. Thus the pelvis will be fixed, so as to allow the necessary extension of the thigh-bone to be made. Great care must be taken during the extension to keep the scrotum and testicles, or the pudenda in women, from being hurt by the sheet passed under the perineum. The patient must be further fixed by being held by assistants.

The best practitioners of the present day in France, advise the extending force to be applied to the inferior part of the leg, in order to have it as far as possible from the parts, which resist the return of the head of the bone into its natural situation. In this country, surgeons generally prefer making the extension by means of a sheet, fastened round the limb just above the condyles of the os femoris. As soon as the head of the bone has been brought on a level with the acetabulum by the assistants, who are making the extension, the surgeon is to force it into this cavity by pressing on the great trochanter.

The extension should always be made in a gradual and unremitting manner: at first, gently; but afterwards more strongly; yet never violently. The difficulty of reduction arises from the great power and resistance of the muscles, and these must at length be fatigued, so as to yield to the extending force, if care be taken, that it be maintained the necessary time, without the least intermission.

In very strong, athletic subjects, it may be proper to bleed them, in order to produce a temporary weakness, for the purpose of facilitating the reduction.

The disappearance of all the symptoms, and the noise made by the head of the bone, when it slips into the acetabulum, denote, that the reduction is effected. The bone is afterwards to be kept from slipping out again, by tying the patient's thighs together with a bandage placed a little above the knees. The patient should be kept in bed at least three weeks; live low, and rub the joint with the *linimentum camph. et saponis.* Due time must be given for the lacerated ligaments to unite, and the sprained parts to recover; and premature exercise may bring on irremediable disease in the joint.

Mr. Hey gives the following directions, and description of the way, in which he reduced a case of this kind.

"The extension of the limb must be made in a right line with the trunk of the body; and, during the extension, the head of the bone must be directed outwards as well as downwards. A rotatory motion of the os femoris on its own axis, towards the spine, (the patient lying prone) seems likely to elevate the great trochanter, bring it nearer to its natural position, and direct the head of the bone towards the acetabulum. These circumstances led to the following method. A folded blanket was wrapped round one of the bed-posts, so that the patient, lying in a prone position, and astride of the bed-post, might have the affected limb on the outside of the bed. The bed was rendered immoveable, by placing it against a small iron pillar, which had been fixed for the purpose of supporting the curtain rods. The leg was bent to a right angle with the thigh, and was supported in that position by Mr. Lucas, who, when the extension should be brought to a proper degree, was to give the thigh its rotatory motion, by pushing the leg inwards, that is, towards the other inferior extremity. Mr. Jones sat before the patient's knee, and was to assist in giving the rotatory motion, by pushing the knee outwards at the same moment. I sat by the side of the patient, to press the head of the bone downwards and outwards during the extension. Two long towels were wrapped round the thigh just above the condyles, one towel passing on the inside of the knee, the other on the outside. Three persons made the extension; but when we attempted to give the thigh its rotatory motion, we found it confined by the towel which passed on the inside of the knee and leg. We therefore placed both the towels on the outside; and in this position the extending force concurred in giving the rotatory motion. The first effort that was made, after the towels were thus placed, had the desired effect, and the head of the bone moved downwards and outwards into the acetabulum." (*Hey's Practical Observations, p.* 313.)

There is another kind of dislocation upward and outward, so rare, that many experienced men have never seen it, and few have mentioned it. I allude to the case, in which the head of the thigh-bone is so situated on the dorsum of the ilium, that it lies forward, the trochanter major backward, and an instance of which I have myself seen in St. Bartholomew's hospital. This case deserves very particular attention, because being attended with a considerable turning of the toes outwards, as well as a shortening of the limb, it is the only example, which is at all likely to be mistaken for a fracture of the neck of the thigh-bone. The case, however, is not difficult of detection; for, you can even feel the head of the bone projecting forward on the ilium, and you cannot rotate the limb inwards, which can be done in cases of fracture, though so doing is productive of immense suffering.

This rare kind of luxation is to be reduced by the same means, and in the same manner, as the common dislocation upwards and outwards, already treated of.

Another of the most frequent luxations of the thigh-bone, is downwards and inwards, upon the obturator foramen. The occurrence of this accident is facilitated by the great extent of the motion of abduction of the thigh; by the notch at the inferior and internal part of the acetabulum; by the weakness of the orbicular ligament on this side; and by the ligamentum teres not opposing, nor being necessarily ruptured by it. The head of the bone is thrown between the obturator ligament, and obturator externus muscle.

The symptoms are as follow: the affected thigh is longer, than the sound one; the head of the femur being situated lower than the acetabulum, the trochanter major is removed to a greater distance from the anterior superior spinous process of the ilium, and the thigh is flattened, in consequence of the elongation of the muscles. A hard, round tumour is felt at the inner and superior part of the thigh, formed by the head of the femur. The leg is slightly bent; and the knee and foot, are turned outwards, and cannot be brought back into their proper direction.

This case, like a fracture, is attended with a turning of the toes outwards; but, besides being easy of discrimination on every account, the elongation of the limb at once denotes, that there is no fracture, which always causes a shortening of the member.

Dislocations on the obturator foramen, are very easy of reduction. The extension is to be made downwards and outwards, so as just to dislodge the head of the bone, and then the muscles generally draw it into the acetabulum, on the extending force being gradually relaxed, and the surgeon pushing the upper part of the bone outward.

The thigh-bone is sometimes, though very seldom, luxated upwards and forwards, into the groin. The whole limb is turned outwards and shortened; the trochanter major is approximated to the anterior superior spinous process of the ilium; the head of the bone forms a tumour in the groin, and, pressing on the anterior crural nerves, causes great pain, numbness, and even paralysis; and the knee is carried backwards.

The head of the bone felt in the groin; the inclination of the knee backwards; and the impossibility of rotating the limb inward; distinguish it from a fracture of the neck of the bone.

It is reduced in the same way, as the luxation downwards and forwards.

Mr. Hey says, that "In this species of dislocation, (downwards and forwards,) as the head of the bone is situated lower than the acetabulum, it is evident, that an extension made in a right line with the trunk of the body, must remove the head of the bone farther from its proper place, and thereby prevent, instead of assisting, reduction. The extension ought to be made with the thigh at a right angle, or inclined somewhat less than a right angle, to the trunk of the body. When the extension has removed the head of the bone from the external obturator muscle, which covers the great foramen of the os innominatum, the upper part of the os femoris must then be pushed or drawn outwards; which motion will be greatly assisted by moving the lower part of the os femoris, at the same moment, in a contrary direction; and, by a rotatory motion of the bone upon its own axis, turning the head of the bone towards the acetabulum." (*Hey*, 316.)

The ensuing case illustrates Mr. Hey's practice.

"The lower bed-post, on the right side of the bed on which the patient lay, was placed in contact with a small immoveable iron pillar (about an inch square in thickness), such as in our wards are used for supporting the curtain rods of the beds. A folded blanket being wrapped round the bed-post and pillar, the patient was placed astride of them, with his left thigh close to the post, and his right thigh on the outside of the bed. A large piece of flannel was put between the blanket and the scrotum, that the latter might not be hurt during the extension.

"The patient sat upright, with his abdomen in contact with the folded blanket which covered the bed-post. He supported himself by putting his arms round the post, and an assistant sat behind him to prevent him from receding backwards. He was also supported on each side.

"Two long towels were put round the lower part of the thigh, after the part was well defended from excoriation by the application of a flannel roller. The knot, which the towels form, was made upon the anterior part of the thigh, that the motion intended to be given to the leg might not be impeded by the towels.

"The thigh being placed in a horizontal position, or rather a little elevated, with the leg hanging down at right angles to the thigh, I sat down upon a chair, directly fronting the patient, and directed a gentle extension to be made by the assistants standing at my left side. This was done with the view of drawing the head of the bone a little nearer to the middle of the thigh, and the extension had this effect. I then placed the two assistants, who held the towels, at my right side, by which means the extension would be made in a direction a little inclined to the sound limb. Mr. Logan stood on the right side of the patient, with his hands placed on the upper and inner side of the thigh, for the purpose of drawing the head of the bone towards the acetabulum, when the extension should have removed it sufficiently from the place in which it now lay.

"I desired the assistants to make the extension slowly and gradually; and to give a signal when it arrived at its greatest degree. At that moment, Mr. Logan drew the upper part of the bone outwards, while I pushed the knee inwards, and also gave the os femoris a considerable rotatory motion, by pushing the right leg towards the left. By these combined motions, the head of the os femoris was directed upwards and outwards, or, in other words, directly towards the acetabulum, into which it entered at our first attempt made in this manner.

"The scrotum, as the patient assured me, was not hurt in the least by the extension." (*Hey*, *p.* 318.)

The last dislocation of the thigh remaining to be spoken of, is that downwards and backwards. The head of the bone rests against that part of the ossa innominata where the ilium and ischium join. The limb is turned outwards. When the luxation is primary, the extremity is lengthened. A hard tumour is felt at the posterior and inferior part of the buttock, and the great trochanter is removed further from the spine of the ilium. When secondary (which is far more frequent), the primary luxation having been upwards and outwards, the foot is turned inwards. The primary luxation downwards and backwards, with the toes turned outwards, is as unusual, as the case upwards and backwards, with the foot in the same position. The lengthening of the limb, however, at once shews the case not to be a fracture.

The pelvis being fixed, as already described, the extension is to be made downwards and forwards, to dislodge the head of the bone, while the surgeon, with a napkin, placed just below the trochanter minor, pulls the upper part of the femur towards the acetabulum.

### DISLOCATIONS OF THE PATELLA.

This bone may be luxated either inwards or outwards, when violently pushed in this direction. The luxation outward is the most frequent, because the bone more easily slips in this direction off the outer condyle of the femur, than inwardly. All these cases are easily reduced, on relaxing the extensors of the leg, and bending the thigh; but, owing to a relaxed state of the ligament of the patella, or other predisposing causes, the bone is sometimes difficultly kept in its proper situation, without applying a roller to the part. The inflammatory affection of the joint is to be opposed by bleeding, purging, and using the saturnine lotion. The joint must be kept quiet a few days, and then gently moved in order to prevent stiffness.

### DISLOCATIONS OF THE KNEE.

The tibia may be luxated forward, backward, or to either side.

The dislocation backward is always incomplete, and sometimes is secondary, being a consequence of white swellings.

The luxation forward is even more rare, than the one backward. Dislocations inward, or outward, are the most frequent, and are always incomplete. The nature of all these cases is so conspicuous at first view, that there is no need of any detail of particular symptoms.

The bones of the leg are sometimes twisted outward, and the internal lateral ligament ruptured; but, this may happen without the crucial ligament being broken. On the other hand, when the bones of the leg are violently twisted inward, both the crucial ligaments, and external lateral ligament, must inevitably be ruptured.

These accidents are all most easily reduced, on making gentle extension, and pushing the head of the tibia in the proper direction. The grand object, after the reduction, is to avert inflammation of the knee, and promote the union of the torn ligaments. The first demands the rigorous observance of the antiphlogistic plan; both require the limb to remain perfectly motionless, supported by one, or two splints. As soon as the ligaments have grown together, and the danger of inflammation is over, which will be in about three weeks, the joint should be gently bent and extended a certain time every day in order to prevent stiffness. Liniments will now also be of service.

### DISLOCATIONS OF THE FOOT.

The foot may be dislocated inwards, or outwards; forwards, or backwards; and either of these luxations may be complete, or incomplete. Dislocations inwards, and outwards, are the most common; the former occurring, however, more frequently, than the latter, which are greatly resisted by the lowness of the malleolus externus.

Many of these accidents are *compound;* that is, attended with a wound communicating with the joint; a circumstance that greatly increases the danger, and is frequently the occasion of the patient's losing his limb, and even his life. It is only, however, when the soft parts are very much contused, and extensively lacerated, that amputation should be had recourse to in the first instance. When the bones are reduced, and the edges of the wound brought into contact, the unpromising aspect of the case is very much diminished, and many, who might think amputation advisable at first view of the accident, would change their mind, as soon as the bones have been replaced.

Dislocations inwards, or outwards, are very easily reduced, and require very little extension. In accomplishing the reduction, it is best to relax the strong muscles of the calf by bending the leg on the thigh. The case is afterwards to be treated in the same way as a fracture of the leg.

Mr. Pott has called the attention of surgeons to a particular kind of dislocation, in which the utility of relaxing the muscles, is strikingly illustrated. I mean the instance, in which, "by leaping, or jumping, the fibula breaks in the weak part already mentioned, that is, within two or three inches of its lower extremity. When this happens, the inferior fractured end of the fibula falls inward towards the tibia, that extremity of the bone which forms the outer ankle, is turned somewhat outward and upward, and the tibia having lost its proper support, and not being of itself capable of steadily preserving its true perpendicular bearing, is forced off from the astragalus inwards; by which means the weak bursal, or common ligament of the joint, is violently stretched, if not torn, and the strong ones, which fasten the tibia to the astragalus and os calcis, are always lacerated; thus producing at the same time a perfect fracture and a partial dislocation, to which is sometimes added, a wound in the integuments, made by the bone at the inner ankle. By this means, and indeed as a necessary consequence, all the tendons which pass behind or under, or are attached to the extremities of the tibia and fibula, or os calcis, have their natural direction and disposition so altered, that, instead of performing their appointed actions, they all contribute to the distortion of the foot, and that by turning it outward and upward.

"When this accident is accompanied, as it sometimes is, with a wound of the integuments of the inner ankle, and that made by the protrusion of the bone, it not unfrequently ends in a fatal gangrene, unless prevented by timely amputation; though I have several times seen it do very well without. But in its most simple state, unaccompanied with any wound, it is extremely troublesome to put to rights, still more so to keep it in order, and, unless managed with address and skill, is very frequently productive both of lameness and deformity ever after.

"After what has been said, a farther explanation why this is so, is unnecessary. Whoever will take even a cursory view of the disposition of the parts, will see that it must be so. By the fracture of the fibula, the dilatation of the bursal ligament of the joint, and the rupture of those which should tie the end of the tibia firmly to the astragalus and os calcis, the perpendicular bearing of the tibia on the astragalus is lost, and the foot becomes distorted; by this distortion the direction and action of all the muscles already recited are so altered, that it becomes (in the usual way of treating this case) a difficult matter to reduce the joint; and, the support of the fibula being gone, a more difficult one to keep it in its place after reduction. If it be attempted with compress and strict bandage, the consequence often is a very troublesome, as well as painful ulceration of the inner ankle, which very ulceration becomes itself a reason why such kind of pressure and bandage can be no longer continued; and if the bone be not kept in its place, the lameness and deformity are such, as to be very fatiguing to the patient, and to oblige him to wear a shoe with an iron, or a laced buskin, or something of that sort, for a great while, or perhaps for life.

"All this trouble, pain, difficulty, and inconvenience, are occasioned by putting and keeping the limb in such position as necessarily puts the muscles into action, or into a state of resistance, which in this case is the same. This occasions the difficulty in reduction, and the difficulty in keeping it reduced; this distorts the foot, and by pulling it outward and upward makes that deformity which always accompanies such accident; but if the position of the limb be changed, if by laying it on its outside, with the knee moderately bent, the muscles forming the calf of the leg, and those which pass behind the fibula, and under the os calcis, are all put into a state of relaxation and non-resistance, all this difficulty and trouble do in general vanish immediately; the foot may easily be placed right, the joint reduced, and by maintaining the same disposition of the limb, every thing will in general succeed very happily, as I have many times experienced." (*Pott.*)

It occasionally happens in compound luxations of the ankle, that the astragalus only remains attached by a few fibres, in which circumstance, if it be judged prudent to attempt the preservation of the limb, it is best to imitate Ferrand and Desault, by extirpating this bone entirely, so as to allow the tibia to become anchylosed to the upper surface of the os calcis.

Dislocations forwards and backwards are not very common. The first case is the most difficult to produce.

The facility, with which all dislocations of the ankle are recognized by surgeons, acquainted with anatomy, renders a particular account of the symptoms quite superfluous.

Both the latter cases are easy of reduction, when care is taken to relax the muscles of the calf, which attention is most particularly essential to prevent the bones from becoming displaced again. The limb must be put in splints, just as if the case were a fracture.

The os calcis and astragalus are so intimately connected, that they are never completely luxated from each other. But, one, or both of these bones may be dislocated from the scaphoides and cuboides by violent force, when the forepart of the foot is fixed. (*J. L. Petit.*) The astragalus and os calcis, particularly the former, may then be luxated upwards into the cavity on the back of the scaphoides, so as to form a tumour on the back of the foot. The reduction is difficult: Boyer in one case could not succeed: but no lameness remained with the deformity.

The first phalanx of the great toe is sometimes dislocated from the first metatarsal bone. The reduction is too simple to need explanation.

On the subject of Dislocations, consult *Duverney's Traité des Maladies des Os. Leçons sur les Maladies des Os rédigées en un Traité complet de ces Maladies par Richerand, Tom.* 2. *Richerand's Nosographie Chirurgicale, Tom.* 3. *p.* 193, &c. *Edit.* 2. *Potit, Traité des Maladies des Os. Œuvres Chirurgicales de Desault, par Bichat, Tom.* 1. *Pott's Remarks on Fractures and Dislocations. Hey's Practical Observations in Surgery. Kirkland's Observations upon Mr. Pott's General Remarks on Fractures, &c. White's Cases in Surgery. Medical Observations and Inquiries, Vol.* 2. *Bromfield's Chirurgical Cases and Observations. Levéillé, Nouvelle Doctrine Chirurgicale, Tom.* 2. *Callisen, Systema Chirurgiæ Hodiernæ, Tom.* 2. *Desault's Journal de Chirurgie. Boyer's Traité des Mal. Chir. T.* 4, *Paris,* 1814.)

**DISTICHIA**, or DISTICHIASIS. (from δις, twice, and ϛιχος, a row.) Gorrhæus, Heister, and St. Ives, agree in applying this term to an affection of the eyelids, in which each tarsus has a double row of eye-lashes, which, inclining inward, irritate the eye, and keep up an ophthalmy. Such authors speak of this, as a very frequent complaint; but, the author of the present article in the *Encyclopédie Méthodique, Partie Chirurgicale,* remarks, that he has never met with it at all, though in ulceration of the eyelids he has often seen a certain number of the eye-lashes incline inward, and cause a good deal of disturbance to the eye, already in a state of inflammation. This disorder cannot be called the true distichiasis. However it may be, all writers recommend plucking out such eye-lashes, as assume an unnatural direction. Some of the hairs are to be taken out at a time, one after the other, and a few days are to be allowed to elapse, before this trivial operation is repeated. In order that the eye-lashes may be, with more certainty, extirpated to their roots, and that others may not grow in the same situation, it is advised to touch the places, from which they grow with the argentum nitratum. (See *Trichiasis.*) (*Encyclopédie Méthodique, Partie Chirurgicale.*)

**DISTORTION.** (from *distorqueo,* to wrest aside.) The bones of the limbs frequently become distorted, in consequence of an unhealthy, ricketty, or scrofulous constitution. Sometimes, they are deformed merely by the contraction of the muscles; and, very frequently, they are naturally distorted by the feet being either turned too much outward, or inward. Mere weakness will sometimes occasion a distortion; for when a child is too soon put to walk, its legs will become crooked from the bones not being strong enough to bear the weight of the body.

Distortions of the limbs are much more easily cured, than those of the spine. As they appear in infancy, when the bones are flexible, they can easily be brought into their proper shape by using machines, sometimes of a very simple kind; but it must always be remembered, that, as the disease, in cases, in which the limbs are not naturally distorted from birth, proceeds from weakness, we must not omit to strengthen the system by tonics. Sometimes, a gentle and long continued pressure will be sufficient to make a bone straight; but, generally, certain machines, or shoes, or boots, of a particular construction, are necessary.

When the limbs are distorted, by reason of a contraction of the muscles, emollient oils are highly recommended. The muscles and tendons, which are supposed to cause the deformity, are to be rubbed throughout their course, for half an hour, or more, three times a day, during which frequent endeavours must be made to extend the limb; but, gradually, and without violence.

*Latta's System of Surgery, Vol.* 2, 467, 468. See *Mollities Ossium; Rachitis; Vertebræ, Diseased; Vari and Valgi.*

**DOLOIRES.** The spiral turns of a roller.

**DURA MATER, FUNGOUS TUMOURS OF.** The dura mater, the outer membrane of the brain, was so named by the ancients, on account of its hardness, and its being formerly supposed to be the source of all the other membranes of the body.

Fungous tumours of the dura mater, the true nature of which was ascertained late in the last century, did not escape the notice of the ancient writers; but, the disease is very imperfectly described by them, and under an erroneous denomination. They supposed, that the swelling was of the encysted kind, or what they termed *natta, talpa, testudo,* and that it gradually altered and destroyed the cranium. They sometimes mistook the fungous, or sarcomatous tumour of the dura mater for coagulated blood, or for ill-conditioned excrescences, like those which make their appearance on ulcers attended with caries. Such are the ideas, which seem to be conveyed by some imperfectly detailed cases in the writings of Lanfranc, Guido di Cauliaco, Theodoricus, and other authors of the thirteenth and fourteenth centuries. Amatus Lusitanus has given the appellation of lupus with caries to a fungous tumour of the dura mater. The swelling occurred in a child eight years old, who died in convulsions, two days after an opening had been made in it.—(*Centur.* 5, *obs.* 8.) Another similar case, which happened in a child, and was noticed by Camerarius at Paris, is styled a singular bony excrescence. (*Ephemer. curios. natur. decur.* 2, *ann.* 6, 1687, *obs.* 99.) Lastly, Cattier, a physician of Montpellier, has recorded the history of a lady, who died from the consequences of a fungous tumour of the dura mater. The disease was so acutely painful, as to compel the patient to cry out. The swelling was opened with caustic. Pimprenelle, a Parisian surgeon, recommended the trepan to be employed; but, his advice was overruled. After death, a fungus of the dura mater, with a perforation in the skull, was detected, and it is described by the author as a hard, stony, substance, accompanied with points and asperities. (*Obs. Med. obs.* 15, *p.* 48.—See *Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 498. *Edit.* 1809.)

The old surgeons, being ignorant of the real character of fungous tumours of the dura mater, used often to commit the most serious and fatal mistakes in the treatment. These diseases are of a chronic nature, and make their appearance gradually, in the form of a tumour, which makes its way through the bones of the cranium, rises up, and insensibly bleads itself with the integuments, which seem, as it were, to make a part of it. Such fungous tumours of the dura mater may originate spontaneously at any part of this membrane; but, they are particularly apt to grow on the surface, which is adherent to the upper part of the skull, or to its basis. They are firm, indolent, and chronic, seeming, as if they were the consequence of slow inflammation, affecting the vessels, which supply the dura mater, and inosculate with those of the diploe. It is very difficult, one might say, impossible, to determine, whether, in an affection of this kind, the disease begins in the dura mater, or the substance of the bone itself. The general belief, however, is, that the bone is affected secondarily, and the disorder originates in the dura mater. The patient, who is the subject of the first case, related in a memoir by M. Louis, had received no blow upon the head, and, could only impute his complaint to a fall, which he had met with four, or five months before, and in which the head had not struck against any thing; but, from this time, he experienced a stunning sensation, which continued till he died. The cranium and dura mater were found both equally diseased. Though this case may tend to shew, that fungous tumours of the dura mater may form spontaneously, yet, it is not the less confirmed by the examination of a vast number of cases, that this affection more frequently follows blows on the head, than any other cause. Hence, a slow kind of thickening of the dura mater is produced, which ends in a sarcomatous excrescence, the formation of which always precedes the destruction of the bone. In the memoir, published by M. Louis in the fifth volume, 4to. of those of the Royal Academy of Surgery, there is a very interesting case, illustrating the nature of the present disease.

The subject was a young man, aged twenty-one, who had a considerable tumour on the left side of the head, which was taken for a hernia cerebri. (*See this Article.*) The swelling had begun in the region of the temple, and had gradually acquired the magnitude of a second head. The external ear was displaced by it, and pushed down as low as the angle of the lower jaw. At the upper part of the circumference of the base of the tumour, the inequalities of the perforated bone, and the pulsations of the brain, could be distinctly felt. Some parts of the mass were elastic and hard, others were soft and fluctuating. A plaster, which had been applied, brought on a suppuration at some points, from which an ichorous matter was discharged. Shiverings and febrile symptoms ensued, and the man died in less than four months, in the year 1764. On dissection, a sarcomatous tumour of the dura mater was detected, together with a destruction of the whole portion of the skull, corresponding to the extent of the disease.

When a tumour of this nature has decidedly formed, it makes its way outward through all the parts, soft or hard, which are opposed to it. The swelling, in becoming circumscribed, is partly blended with the dura mater, and its pressure produces an absorption of such parts of the skull, as oppose its enlargement. It unexpectedly elevates itself externally, confounding itself with the scalp, and presents itself outwardly in the form of a preternatural, soft, yielding swelling, which even sometimes betrays an appearance of a decided fluctuation, or a pulsation, which may make it be mistaken for an aneurismal tumour. When once the swelling has made its exit from the cavity of the cranium, it expands on every side under the integuments, which readily make way for its growth. The scalp becomes distended, smooth, and œdematous over the extent of the tumour, and lastly it ulcerates. The matter, which is discharged from the ulcerations, is thin and sanious; the outer part of the tumour is confounded with the integuments and edges of the skull, on which it rests, so that, in this state, it is easy to mistake the tumour for one, whose base is altogether external. While the swelling thus increases in size externally, it also enlarges internally. The latter change takes place in particular, while the opening in the cranium is not large enough to admit the whole mass of the tumour, which then depresses the brain, and lodges in the excavation, which it forms for itself. But, this cavity quickly diminishes, and becomes reduced almost to nothing, as soon as the tumour projects outwardly. The tables of the skull are absorbed to make way for the swelling to arrive externally; but, it is remarked, that the internal, or vitreous table, is always found much more extensively destroyed, than the external one. Sometimes, new bony matter is found deposited around the opening in the cranium.

It is asserted, that, whatever may be the situation of a fungous tumour of the dura mater, the outer layer of this membrane, upon which the disease forms, is alone altered, the inner layer and the pia mater being always unchanged. (*Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 501. *Edit.* 1809.)

According to surgical writers, fungous tumours of the dura mater have been caused by contusions of the skull, falls on the buttocks, concussions of the head or whole body, lues venerea, scrofula, inveterate rheumatism, &c. The three last of the alledged causes, however, seem to be little better than mere conjecture.

Children of the most tender years are even liable to the disease. M. Louis has related, that a child, two years of age, died of a fungus of the dura mater, which had produced a swelling above the right ear, attended with a destruction of a portion of the parietal and temporal bones. (*Mém. de l'Acad. de Chirurgie, Tom.* 5, *4to. p.* 31.)

The existence of a fungous tumour of the dura mater cannot be ascertained, as long as there is no external change. The effects, produced, may originate from so many causes, that there would be great risk of a gross mistake in referring them to any particular ones. This is not the case, when there is an opening in the skull. Then a hardness, felt from the very first at the circumference of the tumour, denotes that it comes from within. When the swelling is carefully handled, such a crackling sensation is perceived, as would arise from touching dry parchment stretched over the skin. On making much pressure, pain is occasioned, and sometimes a numbness in all the limbs, stupefaction, and other more or less afflicting symptoms. The tumour, in some measure, returns inward, especially, when not very large, and gradually rises up outward again, when the pressure is discontinued. Sometimes, there is pain; at other times, there is none; which may be owing to the manner, in which the tumour is affected by the edges of the bone, through which it passes. The pain is often made to go off by compression, but returns as soon as this is taken off. The tumour has an alternate motion, derived from the pulsation of the brain, or of the large arteries at its base. This throbbing motion has led many into error, by making them mistake the disease for an aneurism, as happened in the second case, related in the memoir of M. Louis. When the tumour is pushed sideways, and the finger carried between it and the edge of the bone, through which the disease protrudes, the bony edge may be felt, touching the base of the swelling, and more or less constricting it. This symptom, when distinguishable, added to a certain hardness and elasticity, and sometimes a facility of reduction, forms a pathognomonic mark, which cannot deceive. By uniting all the preceding symptoms, and exercising, in the investigation, the spirit of combination, so necessary in these difficult cases, fungous tumours of the dura mater may be discriminated from herniæ of the brain, external fleshy tumours, abscesses, exostoses, and other affections, which at first sight resemble them.

Generally speaking, fungous tumours of the dura mater are very dangerous, as well on account of their nature, as of the difficulty of curing them in any certain manner, and of the internal and external disorder, which they may occasion. Such as have a pedicle, the base of which is not extensive; which are firm in their texture, without much disease in the surrounding bone, are moveable, not very painful, and in persons, who are in other respects quite well, are in general reputed to be the least perilous. These are the cases, in which a cure may be attempted, with a hope of success, though the event is always exceedingly doubtful.

When the contrary of what has been just related occurs, when the disease is of long continuance, and the brain already affected, nothing favourable can be expected.

Compression is the most simple means of cure, and that which has naturally occurred to such practitioners, as have mistaken the disease for an aneurism, or a hernia cerebri. The efficacy of this method, has been further misconceived, because the tumour, when not very large, has sometimes been partly, or even wholly reduced, without any bad consequences. This had no little share in leading to errors, concerning the true character o the disease. But, as might be conceived, this reduction, only being attended with temporary success, and having no effect whatever on the original cause of the affection, the symptoms returned, and the tumour rose up again, the moment the compression was discontinued. There is a fact in the memoir of M. Louis, which seems to evince, that good effects may sometimes be produced by compression judiciously employed. A woman, brought to the brink of the grave by the symptoms, occasioned by a tumour of the above kind, having rested with her head, for some time, on the same side as the tumour, found the swelling so suddenly reduced, without any ill effects, that she thought herself cured by some miracle. A compression artfully kept up, by means of a piece of tin, fastened to her cap, prevented the protrusion of the tumour again. The pressure, however, not having been always very exact, the symptoms every now and then recurred, while the tumour was in the act of being depressed again, and they afterwards ceased, on the swelling having assumed a suitable position. The symptoms were, doubtless, occasioned by the irritation, which the tumour suffered, in passing the inequalities around the opening, through which it protruded. The patient lived in this state nine years, having every now and then trances, in one of which, attended with hiccough and vomiting, she perished.

As compression cannot be depended upon, the following safer method may be tried. It consists in exposing the tumour with a knife, which is certainly preferable to caustics, the action of which can never be limited, nor extended, exactly as one wishes. A crucial incision may be made through the scalp covering the tumour, and the flaps dissected up, and reflected, so as to bring all the bony circumference into view. Then with trephines repeatedly applied, or with what would be better, Mr. Hey's saws, all the margin of the bone should be carefully removed.

The tumour, thus disengaged on all sides, may be cut off with a scalpel. After this, some recommend applying to the cut surface an ointment containing the hydrarg. nitrat. rub., an application, which I would not recommend. On the contrary, it seems to me preferable, in order to avoid all occasion for the use of caustic, to remove every part of both layers of the dura mater immediately under the excrescence. By this means, all chance of the regeneration of the tumour will be prevented.

When the tumour is sarcomatous, and its pedicle small and narrow, as sometimes happens, one should not hesitate to cut it off.

This method is preferable to tying the base of such tumours with a ligature, as the latter plan cannot be executed, without dragging, and seriously injuring the dura mater, so as to excite dangerous consequences. The excision is also preferable to caustics, which cause great pain, and very often convulsions. In performing the extirpation, we should remove the whole extent of the tumour, and, if possible, its root, even though it may extend as deeply as the internal layer of the dura mater. This step must not be delayed, for the disease will continue to increase, so as to affect the brain, become incurable, and even mortal. It is to such decision, that we must impute the success, which attended the treatment of the Spaniard Avalos, of whom Marcus Aurelius Severinus makes mention. The above nobleman was afflicted with intolerable head-achs, which no remedy could appease. It was proposed to him to trepan the cranium, an operation, to which he consented. This proceeding brought into view, under the bone, a fungous excrescence, the destruction of which proved a permanent cure of the violent pains, which the disease had occasioned. It is not mentioned in this case, whether the internal layer of the dura mater was healthy, or not; but, there is foundation for believing, that if the extirpation of these tumours be undertaken in time, and bold measures be pursued, as in the instance just cited, success would often be obtained. Indeed, reason would support this opinion; for, when the disease is not extensive, it is necessary to expose a much smaller surface of the dura mater.

It appears to me, however, that trepanning can never be warrantable, unless the disease be indicated by some external changes. I saw my late master, Mr. Ramsden, trepan a man for a mere fixed pain in one part of the head, on the supposition that there was a tumour under the bone; but no tumour was found, and the operation caused inflammation of the dura mater, and proved fatal.

M. Louis has described other tumours, which grow from the surface of the dura mater, after this membrane has been denuded, as after the application of the trephine. They only seem to differ from the preceding ones in not existing, before the opening was made in the skull. These cases are not to be confounded with the hernia cerebri. (*See this Article.*) See on the preceding subject, *Mémoire sur les Tumeurs fongueuses de la Dure-Mere, par M. Louis, in Mém. de l'Académie de Chirurgie, Tom.* 5, *4to., or Tom.* 13, *12mo. Encyclopédie Méthodique, Partie Chirurgicale, art. Dure-Mere. Richerand's Nosographie Chirurgicale, Tom.* 2, *p.* 284. *Edit.* 2. *Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 497. *Edit.* 1809.

An account of the inflammation of the dura mater will be found in the article, *Head, Injuries of.*

# E.

## EAR, DISEASES OF.

An organ, so valuable and necessary to the perfection of our existence, as the ear is, should have all the resources of surgery exerted for the preservation of its integrity, and the removal of the diseases, with which it may be affected. What, indeed, would have been our lot, if nature had been less liberal, and not endued us with the sense of hearing? As M. Leschevin has observed, we should then have been ill qualified for the receipt of instruction; a principal inlet of divine and human knowledge would have been closed; and there being no reciprocal communication of ideas, our feeble reason could never have approached perfection. Even our life itself being as it were dependent upon all such bodies as surround us, would have been incessantly exposed to dangers. The eyesight serves to render us conscious of objects, which present themselves before us, and, when we judge them to be hurtful, we endeavour to avoid them. But, to say nothing of our inability of looking on all sides at once, our eyes become of no service to us, whenever we happen to be enveloped in darkness. The hearing is then the only sense, that watches over our safety. It warns us, not only of every thing, which is moving about us, but likewise of noises, which are more or less distant. Such are the inestimable advantages which we derive from this organ. Its importance, when healthy, makes it worthy of the utmost efforts of surgery, when diseased. (See *M. Leschevin's Dissert. in Mémoires sur les Sujets proposés pour le Prix de l'Acad. Royale de Chirurgie, Tom.* 9. *p.* 111, 112. *Edit.* 12*mo.*)

### 1. *Wounds of the External Ear.*

The external ear, which is a sort of instrument calculated for concentrating the rays of sound, may be totally cut off, without deafness being the consequence. For a few days after the loss, the hearing is rather hard; but, the infirmity gradually diminishes, the increased sensibility of the auditory nerve compensates for the imperfection of the organic apparatus, and the acuteness of the sense is entirely restored. (*Richerand, Nosographie Chirurgicale, Tom. 2, p. 122. Edit. 2.*) However, if we are to credit the statement of other writers, the recovery is far less complete, than M. Richerand represents it to be. Thus Leschevin notices, that they, who have lost the external ear, or have it naturally too flat, or ill shaped, have the hearing less subtile. The defect can only be remedied by an artificial ear, or an ear-trumpet, which receiving a large quantity of the sonorous rays, and directing them towards the meatus auditorius, thus does the office of the external part of the ear. (*Prixde l'Acad. Royale de Chirurgie, Tom. 9, p. 120. Edit. 12mo.*)

Wounds are not the only causes, by which the external ear may be lost: its separation is sometimes the consequence of ulceration, and sometimes the effect of the bites of horses and other animals. In some countries, it is a part, that is frequently attacked with inflammation and sloughing, in consequence of having been frozen. Except the external ear be totally separated from the head, the surgeon should not despair of being able to accomplish the reunion of it. This attempt should always be made, however small a connexion the detached part may have with the skin; for, in wounds of this kind, the efforts of surgery have occasionally succeeded beyond all expectation.

Wounds of the external ear, whatever may be their size and shape, do not require a different treatment from that of the generality of other wounds. The reunion of the divided part is the only indication, and it may be in most instances easily fulfilled by means of methodical dressings. Such writers, as have recommended sutures for wounds of the ear, (says Leschevin,) have founded this advice upon the difficulty of applying to the part a bandage, that will keep the edges of the wound exactly together. The cranium, however, affords a firm and equal surface, against which the external ear may be conveniently fixed. Certainly, it is not more easy to secure dressings on the nose than the ear; and, yet, cases are recorded, in which the cartilaginous part of the nose was wounded, and almost entirely separated, and the union was effected without the aid of sutures. (See *Mém. de M. Pibrac sur l'Abus des Sutures, in Mém. de l'Acad. de Chir. Tom. 3.*)

In wounds of the ear, then, we may conclude, that sutures are generally useless and unnecessary. As examples may occur, however, in which the wound may be so irregular and considerable as not to admit of being accurately united, except by this means, it should not be absolutely rejected. An enlightened surgeon will not abandon altogether any curative plans; he only points out their proper utility, and keeps them within the right limits. When sticking plaster, simple dressings, and a bandage, that makes moderate pressure, appear insufficient for keeping the edges of a wound of the ear in due contact, the judicious practitioner will not hesitate to employ sutures.

When a bandage is applied to the external ear, it should only be put on with moderate tightness, since much pressure gives considerable uneasiness, and may induce sloughing of the part. In order to prevent these disagreeable effects, M. Leschevin advises us to fill the space behind the ear with soft wool or cotton, against which the part may be compressed without risk. (*Op. cit. p.* 119.)

In the application of sutures, the ancients have cautioned us to avoid carefully the cartilage, and to sew separately, one after the other, the skin of both sides of the ear. They were fearful, that pricking the cartilage would make it mortify, "*ce qui est souvente-fois arrivé,*" says Paré. But, notwithstanding so respectable an authority, as M. Leschevin has remarked, the moderns make no scruple about sewing cartilages. In wounds of the nose, Verdue expressly directs the skin and cartilage to be pierced at once in applying sutures, and the success of the plan is put out of all doubt by a multitude of facts. The same treatment may also be safely extended to the ear.

Celsus, lib. 8, c. 6, has mentioned fractures of the cartilage of the ear; but, such an accident seems hardly possible, unless the part be previously ossified. Hence, M. Leschevin could never meet with such a case, either in practice, or in the works of surgical writers.

### 2. *Of the Meatus Auditorius, and its Imperfections.*

This is the passage, which leads from the cavity of the external ear, called the concha, down to the membrane of the tympanum. It is partly cartilaginous, and partly bony, and has an oblique winding direction, so that its whole extent cannot be easily seen. There are circumstances, however, in which it is proper to look as far as possible into the passage. Such is the case, when the surgeon is to extract any foreign body, to remove any excrescence, or to detect any other occasion of deafness. Fabricius Hildanus gives a piece of advice upon this subject, not to be despised; namely, to expose the ear to the rays of the sun, in order to be enabled to see the very bottom of the meatus auditorius externus.

The surgical operations practised on the meatus auditorius, are confined to opening it, when preternaturally closed, extracting foreign bodies, washing the passage out with injections, and removing excrescences, which may form there.

The case, which we shall next treat of, is the imperforation of the meatus auditorius externus, a defect with which some children are born. When the malformation exists in both ears, it generally renders the subject dumb, as well as deaf, for, as he is incapable of imitating sounds, which he does not hear, he cannot of course learn to speak, although the organs of speech may be perfect, and in every respect rightly disposed. In this case, the surgeon has to rectify the error of nature, and, (to use the language of M. Leschevin,) he has to give by a double miracle, hearing and speech to an animated being, who, deprived of these two faculties, can scarcely be regarded in society as one of the human race. How highly must such an operation raise the utility and excellence of surgery in the estimation of the world!

About twelve years ago, I remember a child being shewn to several medical gentlemen in London, as a curiosity: it was entirely destitute of all appearance of external ears, and no vestiges of the meatus auditorii could be seen. The natural situations of these openings were completely covered with the common integuments. Yet, it deserves attention, that the child could hear a great deal, though the sense was certainly dull and imperfect. I remember, that the circumstance of the patient hearing so well as he did, was what excited considerable surprize. I am sorry I do not more particularly recollect, at the present time, the degree, in which this sense was enjoyed, and several other circumstances, such as the child's age, power of speech, &c. The example, however, is interesting, inasmuch as it proves, contrary to the assertions of authors, that even an imperforate condition of both ears may be unattended with complete deafness, provided the internal and more essential parts of these organs are sound and perfectly formed.

When the meatus auditorius externus is merely closed by an external membrane, the nature of the case is evident, and the mode of relief equally easy. But, when the membrane is more deeply situated in the passage, near the tympanum, the diagnosis is attended with more difficulty, and the treatment with greater trouble.

If the preternatural membrane is external, or only a little way within the passage, it is to be divided with a bistoury; the small flaps are to be cut away; a tent, of a suitable size, is to be introduced into the opening; and the wound is to be healed *secundum artem*, care being taken to keep it constantly dilated, until the cicatrization is completed.

When the obstruction is deeply situated, we must first be sure of its existence, which is never ascertained, or even suspected, till after a long while. It is not till after children are past the age, at which they usually begin to talk, that any defect is suspected in the organ of hearing, because until this period, little notice is taken, whether they hear or not. As soon as it is clear, that this sense is deficient, the ears should always be examined with great attention, in order to discover, if possible, the cause of the deafness. Sometimes, the infirmity depends upon a malformation of the internal ear, and the cause does not then admit of detection. The most convenient method of making the examination is to expose the ear, which is about to be examined, to the light of the sun. In this situation, the surgeon will be able to see beyond the middle of the bony part of the meatus, if he places his eye opposite the orifice of the passage, and takes care to efface the curvature of the cartilaginous portion of the canal, by drawing upward the external ear. If the passage has been carefully cleansed, before the examination, the skin, forming the obstruction, may now be seen, unless it be immediately adherent to the tympanum.

When the preternatural septum is not closely united to the tympanum, its destruction should be attempted, and hopes of effecting the object, either suddenly, or gradually, may reasonably be entertained. According to M. Leschevin, the particular situation of the obstruction is the circumstance, by which the surgeon ought to be guided in making a choice of the means for this operation. If the membranous partition is so far from the tympanum, that it can be pierced without danger of wounding the latter part, there can be no hesitation in choosing the plan to be adopted. In the contrary state of things, M. Leschevin is an advocate for the employment of caustic, not only on account of the risk of injuring the tympanum with a cutting instrument, but, also, because, if the puncture were ever so well executed, a tent could not be introduced into it, so as to prevent it from closing again.

In the first case, a very narrow sharp-pointed bistoury should be used: after its blade has been wrapped round with a bit of tape to within a line of the point, it is to be passed perpendicularly down to the preternatural membrane, which is to be cut through its whole diameter. The instrument being then directed first towards one side, then the other, the crucial incision is to be completed. As the flaps, which are small and deeply situated, cannot be removed, the surgeon must be content with keeping them separated by means of a blunt tent. The wound will heal just as favourably as that occasioned in removing the imperforation of the concha, or outer part of the meatus auditorius. (*Prix de l'Acad. de Chir. p.* 124—126, *Tom.* 9.) In the second case, that is to say, when the risk of wounding the tympanum leads us to prefer the employment of caustic, the safest and most commodious way of putting the plan in execution would be that of touching the obstruction, as often as circumstances may require, with the extremity of a bougie armed with the argentum nitratum. In the intervals of the applications, no dressings need be introduced, except a bit of clean soft cotton, for the purpose of absorbing any discharge, which may take place within the passage.

It is manifest, that if the whole, or a considerable part of the meatus auditorius externus were wanting, the foregoing measures would be insufficient. The following observations of M. Leschevin seem to merit attention: "I do not here allude to cases, in which a malformation of the bone exists. I know not, whether there are any examples of such an imperforation; but, it is clear, that it would be absolutely incurable. I speak of a temporal bone perfectly formed in all its parts, and the meatus auditorius of which, instead of being merely lined by a membrane, as in the natural state, is blocked up by the cohesion of the parietes of this membrane throughout a certain extent of the canal; just as the urethra, rectum, or vagina, is sometimes observed to be not simply closed by a membrane, but by a true obliteration of its cavity.

"Such a defect in the ear may be congenital, and it may also arise from a wound, or ulceration, of the whole circumference of the meatus auditorius externus, this canal having become closed by the adhesion of its parietes, on cicatrization taking place.

"Such an imperforation, whether congenital, or accidental, must certainly be more difficult to cure, than the examples treated of above; but. (says M. Leschevin) I do not for this reason believe, that the case ought to be entirely abandoned. Yet, I would not have the cure attempted in all sorts of circumstances. For instance, if the defect only existed in one ear, and the other were sound, I would not undertake the operation, because, as the patient can hear tolerably well on one side, the advantages which he might derive from having the enjoyment of the other ear, would not be adequate to counterbalance the pain and bad symptoms occasioned by such an experiment, the success of which is extremely uncertain. I would not then run the risk of making a perforation, except in a case of complete deafness; and I propose this means only as a dubious one upon the fundamental maxim, so often laid down, that it is preferable to employ a doubtful remedy, than none at all.

"With respect to the mode of executing this operation," says M. Leschevin, "the trocar seems the most eligible instrument. I would employ one, that is very short, and the point of which is bluntish, and only projects out of a cannula as little as possible. This construction would indeed make the instrument less adapted to pierce any thing; but, still, as the parts to be perforated are firm, their division might be accomplished sufficiently well; and the inconvenience of a trivial difficulty in the introduction of the trocar is comparatively much less, than that, which would attend the danger of wounding with a sharper point the membrane of the tympanum. I would plunge the point of the instrument into the place, where the opening of the meatus auditorius externally ought naturally to be, and which would be denoted, either by a slight depression, or at all events by attending to the different parts of the ear, especially, the tragus, which is situated directly over this passage. I would push in the trocar gently, in the direction of the canal formed in the bone, until the point of the instrument felt as if it had reached a vacant space. Then, withdrawing the trocar, and leaving the cannula, I would try, whether the patient could hear. I would then introduce into the cavity of the cannula itself a small, rather firm tent, of the length of the passage, or rather a small bougie. By means of a probe, I would push it to the end of the cannula, which I would now take out, observing to press upon the tent, which is to be left in. The rest of the treatment consists in keeping the canal pervious, making it suppurate, and healing it with common applications. One essential caution, however, would be that of keeping the part dilated long after it had healed: otherwise, it might close again, and a repetition of the operation become necessary. This happened to Heister, as he himself apprises us, and it occurred to Roonhuysen in treating imperforations of the vagina.

"If the cohesion of the parietes of the meatus auditorius externus were to extend to the tympanum inclusively, the operation would be fruitless; but, as it is impossible to ascertain this circumstance, before the attempt is made, the surgeon would incur no disgrace by relinquishing the operation, and giving up the treatment of an incurable disease. If, then, after the trocar were introduced to about the depth of the tympanum, the situation of which must be judged of by our anatomical knowledge, no cavity were met with, the operation should be abandoned; and, if, in these circumstances, any one were to impute the want of success to the inefficacy of surgery, or the unskilfulness of the surgeon, he would act very unfairly.

"It is also plain, that such an operation could only cure a congenital deafness, inasmuch as the infirmity might depend solely upon the imperforation; for, if there should exist, at the same time, in the internal ear, any malformation, which might destroy the power of the organ, the remedying of the external defect would be quite useless." (*Leschevin, in Prix de l'Acad. de Chirurgie, Tom.* 9, *p.* 127—132.)

We find, that this author entertains a great dread of wounding the tympanum, and, certainly he is right in generally insisting upon the prudence of avoiding such an accident. It will appear, however, in the sequel of this article, that puncturing the tympanum has, under certain circumstances, been successfully practised, as a mode of remedying deafness: so far is it from being particularly dangerous, or destructive of the functions of the ear.

### 3. *Unusual smallness of the Meatus Auditorius Externus.*

Imperforation is not the only affection of the meatus auditorius, with which nature sometimes afflicts us, before our birth. This passage is occasionally too narrow, and, hence, there is not room enough for the entrance of a due quantity of the sonorous rays, and the sense is of course unavoidably feeble. Leschevin mentions, that M. de la Metrie had seen this canal so narrow in a young person, that it could hardly admit a probe. What has been observed concerning the imperforation is also applicable to this case. If it depends upon malformation of the bone, it is manifestly incurable; but, if it is owing to a thickening of the soft parts, within the meatus, hopes may be indulged of doing good by gradually dilating the passage by tents, which should be increased in size from time to time, and, lastly, making the patient wear for a considerable time, a tube, adapted to the part in shape. (*Leschevin, in Prix de l'Acad. de Chirurgie, Tom.* 9, *p.* 132.)

### 4. *Faulty shape of the Meatus Auditorius Externus.*

Anatomy informs us, that this passage is naturally oblique, and somewhat winding; and natural philosophy teaches us the necessity of such obliquity, in demonstrating, that it multiplies the reflections of the sonorous rays, and thereby strengthens the sense. This theory, says M. Leschevin, is confirmed by experience; for, there are persons, in whom the meatus auditorius is almost straight, and they are found to be hard of hearing. If there is any means of correcting this defect, it must be that of substituting, for the natural curvature of the passage, a curved and conical tube, which must be placed at the outside of the organ, just like a hearing trumpet. The acoustic instrument, invented by Deckers, which is much more convenient, might also prove useful.—(*Op. cit. p.* 133.)

### 5. *Extraneous Substances, Insects, &c. in the Meatus Auditorius Externus.*

Foreign bodies met with in this situation are inert substances, which have been introduced by some external force; insects, which have insinuated themselves into the passage; or the cerumen itself, hardened in such a degree, as to obstruct the transmission of the sonorous undulations. Worms, which make their appearance in the meatus auditorius, are always produced subsequently to some ulcerations in the passage, or in the interior of the tympanum, and, very often, such insects are quite unsuspected causes of particular symptoms. In the cases of surgery published in 1778 at Stockholm, by Olaus Acrel, there is an instance confirming the statement just offered. It is the case of a woman, who, having been long afflicted with a hardness of hearing, was suddenly seized with most violent convulsions, without any apparent cause, and soon afterwards complained of an acute pain in the ear. This affection was followed by a recurrence of convulsions, which were more vehement, than before. A small tent of fine linen, moistened with a mixture of oil and laudanum, was introduced into the meatus auditorius, and, on removing it the next day, several small round worms were observed upon it, and, from that period, all the symptoms disappeared. To this case, we shall add another from Morgagni. A young woman consulted Valsalva, and told him, that when she was a girl, a worm had been discharged from her left ear; that another one, about six months ago, had also been discharged, very much like a small silk-worm in shape. This event took place after some very acute pain in the same ear, the forehead, and temples. She added, that since this, she had been tormented with the same pains, at different intervals, and, so severely, that she often swooned away for two hours together. On recovering from this state, a small worm was discharged, of the same shape as, but much smaller than, the preceding one, and that she was now afflicted with deafness and insensibility on the same side. After hearing this relation, Valsalva no longer entertained any doubt of the membrane of the tympanum being ulcerated. He proposed the employment of an injection, in order to destroy the nest of worms, which he presumed to exist. For this purpose, distilled water of St. John's wort, in which mercury had been agitated, was used. Morgagni adds, that nothing appears to him more proper, in such cases, to prevent a recurrence of such worms, than to avoid going to sleep, particularly in autumn and summer, without taking care to stop up the affected ear. If this be not done, flies attracted by the suppuration, enter the meatus auditorius, and, while the patient is inconscious, deposit their eggs in the ear. Acrel, in speaking of worms, generated in the meatus auditorius, observes, that there is no better remedy for them, than the decoction of ledum palustre, injected into the ear, several times a day. However, as it is not always possible to procure this plant, we shall recommend in such cases, in preference to all other remedies, a slight infusion of tobacco in oil of almonds, a few drops of which are to be introduced into the ear, and to be retained there by means of a little bit of cotton. This application, which is not injurious to the lining of the passage, is fatal to insects, and, especially, to worms, as various experiments have convinced naturalists. This method may also succeed in cases, in which caterpillars, ants, and other insects, have insinuated themselves into the meatus auditorius; but, it is always better, first to endeavour to extract them. A piece of lint, smeared with honey, often suffices for this purpose, and when they cannot be extracted by this simple means, they may be taken out with a very small pair of forceps, however little of them may be visible. The latter method serves also for the extraction of cherry-stones, peas, or other seeds, which have been introduced into the meatus auditorius. If such substances should make too much resistance, forceps with stronger blades for breaking the extraneous bodies must be employed, and then the fragments are to be extracted piecemeal. But, in these cases, it is always proper to inject into the ear some oil of almonds, before attempting to extract the extraneous bodies. The presence of these substances often occasions the most extraordinary symptoms, as we may see in the fourth observation of Fabricius Hildanus. Cent. 13.

After four surgeons, who had been successively consulted, had in vain exerted all their industry to extract a bit of glass from the left ear of a young girl, the patient found herself abandoned to the most excruciating pain, which soon extended to all the side of the head, and which, after a considerable time, was followed by a paralysis of the left side, a dry cough, suppression of the menses, epileptic convulsions, and at length an atrophy of the left arm. Hildanus cured her by extracting the piece of glass, which had remained eight years in her ear, and had been the cause of all this disorder. Although the extraction must have been very difficult, it does not appear that Hildanus found it necessary to practise an incision behind the ear, as some authors have advised, and amongst them, Duverney, who has quoted the foregoing case. We must agree with Leschevin, that such an incision does not seem likely to facilitate the object very materially; for, it must be on the outside of the extraneous substance, which is the bony part of the canal. It is true, indeed, that the incision enables us, in some measure, to avoid the obliquity of the passage, as Duverney has observed; but, it is not such obliquity of the cartilaginous portion of the canal, that can be a great impediment; for, as it is flexible, it may easily be made straight, by drawing upward the external ear. Hence, Fabricius ab Aquapendente rejected this operation, which was first proposed by Paulus Ægineta; and it is justly disapproved of by Leschevin. (*Prix de l'Acad. de Chir. Tom.* 9, *p.* 147, *edit* 12*mo.*)

### 6. *Meatus Auditorius obstructed with thickened, or hardened Cerumen.*

The cerumen, which is secreted into the meatus auditorius by the sebaceous glands of the part, frequently accumulates there in very large quantities, and becoming harder and harder, at length acquires so great a degree of solidity, as entirely to deprive the patient of the power of hearing. Galen has remarked; *è numero eorum quæ meatum obstruunt, sordes esse quæ in auribus colligi solent.* This species of deafness is one of those kinds, which are the most easy of cure, as is confirmed by observers, especially Duverney. Frequent injections, either with simple olive oil, or oil of almonds, have always been recommended in such cases. The injection is to be retained by a piece of cotton, and, when there is reason to believe that the matter is sufficiently softened, an attempt may be made to extract it by means of a small scoop-like instrument. Whatever success this plan may have obtained, various experiments were made at Chester, in 1769, by Haygarth, from which it appears, that warm water is still preferable. This dissolves the mucous matter, which connects together the truly ceruminous particles, and which is the cause of their tenacity; other applications only succeeding by reason of the water which they contain.

"The symptoms (says Mr. Saunders)

which are attached to the inspissation of the cerumen are pretty well known. The patient, besides his inability to hear, complains of noises, particularly a clash or confused sound in mastication, and of heavy sounds, like the ponderous strokes of a hammer.

"The practitioner is led by the relation of such symptoms to suspect the existence of wax; but he may reduce it to a certainty by examination.

"Any means capable of removing the inspissated wax may be adopted; but syringing the meatus with warm water is the most speedy and effectual, and the only means necessary. As the organ is sound, the patient is instantaneously restored." (*Anatomy of the human Ear, with a Treatise on its Diseases, by J. C. Saunders*, 1806. *p.* 27, 28.)

### 7. *Discharges from the Meatus Auditorius.*

Purulent discharges from the ear, either come from the meatus auditorius externus itself, or they originate from suppuration in the tympanum, in consequence of blows on the head, abscesses after malignant fevers, the small-pox, or the venereal disease. In such cases, the little bones of the ear are detached, and escape externally, and complete deafness is most frequently the consequence. However, in a few instances, total deafness does not always follow even this kind of mischief, as I myself have witnessed in one or two instances. There is greater hope, when the disorder is confined to the meatus; as judicious treatment may now avert the most serious consequences. In Acrel's surgical cases, there is a case, relative to the circumstance, of which we are speaking. Suppuration took place in the meatus auditorius externus, in consequence of acute rheumatism, which was followed by vertigo, restlessness, and a violent headach. The matter discharged was yellowish, of an aqueous consistence, and acid smell. The meatus auditorius was filled with a spongy flesh. On introducing a probe, our author felt a piece of loose rough bone, which he immediately took hold of with a pair of forceps, and extracted. From the time, when this was accomplished, the discharge diminished; and with the aid of proper treatment, the patient became perfectly well.

The meatus auditorius, like all other parts of the body, is subject to inflammation. This is frequently produced by exposure to cold. It is hardly necessary to say, that topical bleeding and antiphlogistic means in general are indicated. The meatus auditorius should also be protected from the cold air, particularly in the winter season, by means of a piece of cotton.

Mr. Saunders observes, "When the means employed to reduce the inflammation have not succeeded, and matter has formed, it is generally evacuated, as far as I have observed, between the auricle and mastoid process, or into the meatus. If it has been evacuated into the meatus, the opening is most commonly small, and the spongy granulations, squeezed through a small aperture, assume the appearance of a polypus. Sometimes the small aperture, by which the matter is evacuated, is in this manner even closed, and the patient suffers the inconvenience of frequent returns of pain from the retention of the discharge. When the parts have fallen into this state, it will be expedient to hasten the cure by making an incision into the sinus, between the auricle and mastoid process.

"It occasionally happens, that the bone itself dies, in consequence of the sinus being neglected, or the original extent of the suppuration. The exfoliating parts are the meatus externus of the os temporis or the external lamina of the mastoid process." (*Page* 24, 25.)

### 8. *Excrescences in the Meatus Auditorius.*

Though the membrane, lining the meatus auditorius, is very delicate, it is not the less liable to become thickened, and to form polypous excrescences. This case, however, is not common. As such tumours are ordinarily firmer in their texture, than polypi of the nose, they are sometimes not so easily extracted with forceps. When they are situated near the external orifice, and admit of being taken hold of with a small pair of forceps, or a hook, they may easily be cut away, when drawn outward, and this without any reason for fearing hemorrhage. This, indeed, is usually very trivial. When the tumours are more deeply situated, Mr. B. Bell recommends giving the preference to the use of a ligature. Here the same plan may be pursued as will be explained in the article *Polypus.* But it sometimes happens, that the excrescences cannot be removed in this manner; as, instead of being adherent by a narrow neck, they have a broad base, which occupies a considerable extent of the passage. In such cases, some have been so absurd as to advise the use of escharotics; but, as these applications cannot be used without risk of injuring the membrane of the tympanum, it is better to have recourse to some other method. (*Encyclopédie Méthodique; Partie Chirurgicale. Art. Auditif conduit.*) Mr. B. Bell recommends dilating the passage with bougies; but it is obvious that the pressure of such instruments would also be very likely to irritate and inflame the membrane of the tympanum.

### 9. *Herpes of the Meatus Auditorius.*

An herpetic ulcerous eruption sometimes affects the meatus auditorius and auricle, producing considerable thickening of the skin, and so great an obstruction of the passage, that a good deal of deafness is the consequence. Mr. Saunders remarks, that, in this case, "the ichor, which exudes from the pores of the ulcerated surface, inspissates in the meatus, and not only obstructs the entrance of sound, but is accompanied with a great degree of fœtor. This disease is not unfrequent. I have never seen it resist the effect of alterative medicines," the use of injections containing the hydrargyrus muriatus, and the application of the unguentum hydrargyri nitrati. Mr. Saunders exhibited calomel as the alterative, and, in one instance, employed a solution of the argentum nitratum, as an injection. (*Page* 25, 26.)

### 10. *Affections of the Tympanum.*

This is sometimes affected with a puriform ichorous discharge, attended with a loss of hearing, proportionate to the degree of disorganization which this part of the ear has sustained. In general, on blowing the nose, air is expelled at the meatus auditorius externus; and, when this is the case, it is evident, that the discharge is connected with an injury, or destruction of the membrana tympani. However, when the Eustachian tube is obstructed with mucus, or matter, or when it is rendered impervious, and permanently closed by inflammation, the membrana tympani may not be perfect, and, yet, it is clear, no air can in this state be forced out of the external ear in the above manner. An examination with a blunt probe, or with the eye, while the rays of the sun fall into the passage, should therefore not be omitted. If the membrane have any aperture in it, the probe will pass into the cavity of the tympanum, and the surgeon feel that his instrument is in contact with the ossicula.

In this manner the affection may be discriminated from an herpetic ulceration of the meatus auditorius externus. The causes are various: In scarlatina maligna, the membrana tympani occasionally inflames, and sloughs; all the ossicula are discharged, and, if the patient live, he continues quite deaf. An ear-ach, in other words, acute inflammation of the tympanum, is the most common occasion of suppuration in this cavity, in which, and the cells of the mastoid process, a good deal of pus collects. At length, the membrana tympani ulcerates, and a large quantity of matter is discharged; but, as the secretion of pus still goes on, the discharge continues to ooze out of the external ear.

Instead of stimulating applications, inflammation of the tympanum demands the rigorous employment of antiphlogistic means. Unfortunately, it is a too common practice, in this case, to have recourse to acrid spirituous remedies. Above all things the repeated application of leeches to the skin behind the external ear, and over the mastoid process, should never be neglected. As soon as the inflammation ceases, the degree of deafness, occasioned by it, will also disappear. This, however, does not always happen.

When an abscess is situated in the cavity of the tympanum, Mr. Saunders seems to think, that the membrana tympani should not be allowed to burst by ulceration, but be opened by a small puncture. (*Page* 31.)

Sometimes the disease, of which we are treating, is more insidious in its attack: slight paroxysms of pain occur, and are relieved by slight discharges. The case goes on in this way, until, at last, a continual discharge of matter from the ear takes place. The disorder is destructive in its tendency to the faculty of hearing, and it rarely stops until it has so much disorganized the tympanum and its contents, as to occasion total deafness. Hence Mr. Saunders very properly defends the propriety of making attempts to arrest its progress,—attempts which are free from danger; and he censures the foolish fear of interfering with the complaint, founded on the apprehension, that bad constitutional effects may originate from stopping the discharge.

If the case be neglected, the tympanum is very likely to become carious; before which change, the disease, says Mr. Saunders, is most commonly curable.

Mr. Saunders divides the complaint into three stages; 1. A simple puriform discharge. 2. A puriform discharge complicated with funguses and polypi. 3. A puriform discharge with caries of the tympanum. As the disease is a local one, direct applications to the parts affected are chiefly entitled to confidence. Blisters and setons may be advantageously employed in aid of topical applications. Mr. Saunders's practice, in these cases, consists in administering laxative medicines and fomenting the ear, while inflammatory symptoms last, and afterwards injecting a solution of zincum vitriolatum, or cerussa acetata.

In the second stage, when there are funguses, he removes or destroys them with forceps, afterwards touches their roots with the argentum nitratum, or injects a solution of alum, zincum vitriolatum, or argentum nitratum.

### 11. *Obstruction of the Eustachian Tube.*

This is often a cause of a considerable degree of deafness, because it is necessary for perfect hearing, that air should be conveyed from the mouth through this passage into the cavity of the tympanum, which now can no longer happen.

A degree of deafness generally attends a severe cold, which is accounted for by the Eustachian tube being obstructed with thickened mucus. Mr. Saunders tells us, that the obstruction most frequently arises from syphilitic ulcers in the throat, or sloughing in the cynanche maligna. The deafness comes on when such sores are healed, that is, when the obstruction is complete. The descent of a nasal polypus into the pharynx, and enlarged tonsils have also been known to close the tube. (*Page* 42.)

When the Eustachian tube is obstructed, the patient cannot feel the membrana tympani crackle, as it were, in his ear, on blowing forcibly with his nose and mouth stopped. Previous ulceration, or disease, of the throat, will sometimes aid in facilitating the diagnosis.

When the Eustachian tube is obstructed with mucus, it has been proposed to employ injections, which are to be thrown by means of a syringe and catheter, into the guttural orifice of that canal. This operation, however, is alleged to be always attended with trouble, and, when the os spongiosum inferius happens to be situated near the floor of the orbit, the introduction of any instrument like a female catheter, would be impracticable. (*Richerand Nosographie Chirurgicale, Tom.* 2. *p.* 131, *edit.* 2.)

Mr. A. Cooper had noticed, that hearing was only impaired, not lost, when suppurations in the tympanum, had injured, and even destroyed the membrana tympani, and that the degree of deafness by no means equalled what resulted from an obstruction of the Eustachian tube. Hence, when the tube was permanently obliterated, he conceived that a small puncture of the membrana tympani might be the means of enabling the patient to hear. Mr. A. Cooper practised the plan with success, and others have imitated him with the same result.

The operation consists in introducing an instrument, resembling a hydrocele trocar, but curved, into the meatus auditorius externus, and pushing it through the anterior and inferior part of the membrana tympani; a place rendered most eligible, on account of the situation of the chorda tympani and manubrium of the malleus, parts which should be left uninjured. The instrument must not be introduced far, lest it should wound the vascular lining of the tympanum, and cause a temporary continuance of the deafness, by an effusion of blood. When the puncture is made, in proper cases, and in a judicious manner, hearing is immediately restored. A small hole in the membrana tympani now conveys the air into the cavity of the tympanum, answering the same purpose as the Eustachian tube.

The surgeon will be able to operate with more ease, if he take care to lessen the curvature of the meatus auditorius by drawing upward the external ear.

There is some chance of a relapse in consequence of the opening closing up. This consideration has led Richerand to propose making the aperture with caustic, so as to destroy a part of the membrane, (*Nosographie Chirurgicale, Tom.* 2, *p.* 132, *edit.* 2.) The suggestion is not, however, likely to be adopted, on account of the inconveniences of applying caustic within the ear. Mr. Saunders is an advocate for making the opening large. This gentleman relates, that he instantaneously restored hearing in one case, in which the patient had been deaf thirty years, in consequence of a loss of part of his palate by syphilis, (*Page* 45.) Mr. A. Cooper's cases are in the *Philosophical Transactions for* 1802.

Puncturing the membrana tympani has been attended with some degree of success in France, as well as this country. It is not to be dissembled, however, that there are numerous failures. We are informed, that Professor Dubois has done the operation in four instances, without success. (*Richerand Nosographie Chirurgicale, Tom.* 2, *p.* 132.)

In most cases, the patients, who have been benefited, are said to have experienced pain just after the trocar was withdrawn. The organ, in consequence of not being accustomed to sound, had become so extremely sensible, that it could not bear the gentlest impression of the sonorous vibrations, and the patient's first request, after the perforation was made, was that they, who were near him, might speak softly. This excessive tenderness of the sense gradually subsides.

### 12. *Diseases of the Labyrinth.*

No doubt deafness (and that kind of it which so frequently foils the most skilful men) arises from an insensible state of the portio mollis of the auditory nerve, or of the surfaces, on which its filaments are spread. This affection is analogous to the amaurosis, or gutta serena, in which, though every part of the eye may seem to possess its natural structure, sight is lost, because the rays of light only strike against a paralytic, or insensible retina. Mr. Saunders dissected the ears of two deaf patients, with the greatest care, but could not discover the least deviation from the natural structure. Mr. Cline, however, found the labyrinth of a person born deaf filled with a caseous substance, in lieu of the natural limpid fluid, found in this situation, and the supposed use of which is to transmit the vibration of sound.

Mr. Saunders remarks, that all the diseases of the internal ear may be denominated nervous deafness; the term, in this sense, embracing every disease, the seat of which is in the nerve, or parts containing the nerve. Nervous deafness is attended with various complaints in different cases, noises in the head of sundry kinds, the murmuring of water, the hissing of a boiling kettle, rustling of leaves, blowing of wind, &c. Other patients speak of a beating noise, corresponding with the pulse, and increased by bodily exertion, in the same degree as the action of the heart. *Saunders, p.* 47.

According to this author, there is a syphilitic species of nervous deafness, attended with a sensation of some of the above peculiar noises: he relates a case, in which the hearing was completely restored, in five weeks, by a mercurial course.

Mr. Saunders has relieved several cases of nervous deafness by confining patients to low diet, giving them calomel freely, repeated doses of sulphate of soda, magnesia, sometimes twice, sometimes thrice, a week, or according to circumstances, and applying blisters behind the ears at intervals of a week. This plan is to be persevered in.

Were I to offer an opinion, on this subject, I should certainly say, that the analogy, between the deafness arising from paralysis of the nerve, and amaurosis, is so great, that the very same treatment, which has been found efficacious in the latter cases, promises to be of most avail in the former. (See *Amaurosis.*) The reader may consult *Duverney sur l'Organe de l'Ouie; Mémoire sur la Théorie des Maladies de l'Oreille, et sur les moyens que la Chirurgie peut employer pour leur curation, in prix de l'Acad. de Chirurgie, Tom.* 9, *p.* 111, *&c. edit.* 12*mo. Richerand's Nosographie Chirurgicale, Tom.* 2, *p.* 135, *&c. edit.* 4. *A. Cooper, in the Philosophical Transactions for* 1802; *Saunders on the Anatomy and Diseases of the Ear,* 1806. *Lassus, Pathologie Chirurgicale, T.* 1, *p.* 84, *edit.* 1809.

**ECCHYMO'MA, or ECCHYMOSIS.** (from *εκχυω*, to pour out.) This is a superficial, soft swelling, which makes the skin livid or blue, and is produced by blood extravasated in the cellular substance.

The causes of an ecchymosis are falls, blows, sprains, &c. which occasion a rupture of the small vessels on the surface of the body, and a consequent effusion of blood, even without any external breach of continuity. Ecchymosis is one of the symptoms of a contusion. (See *Contusion.*) A considerable ecchymosis may originate from a very slight bruise, when one of the ruptured vessels is capable of pouring out a large quantity of blood into the interstices of the cellular substance. Ecchymosis does not, in general, make its appearance till several hours after the operation of its cause; at least, it is not till after this time that the black, blue, and livid colour of the skin is most conspicuous. A black eye, which is only an ecchymosis, is always most disfigured six or eight hours after its occurrence.

In the article *Bleeding,* we have noticed how an ecchymosis may arise from the blood getting out of the vein into the adjacent cellular substance.

Common cases of ecchymosis are generally easily cured, by applying discutient lotions, and administering one or two doses of any mild purgative salt. The best topical applications are vinegar, the lotio muriatis ammoniæ; spirit, vin. camph. and the liquor ammon. acet.

The object is to avert inflammation, and to promote the absorption of the extravasated fluid.

I have seen such success attend the practice of dispersing collections of extravasated blood, by means of absorption, that the plan of evacuating it by an incision, seems to me to be seldom necessary in cases of ecchymosis. When an opening is made into these tumours, and air is admitted, the portion of blood which cannot be pressed out, soon putrefies, and extensive inflammation and suppuration, are the too frequent consequences.

The quick and powerful action of the absorbent vessels in removing extravasations of blood, can now be no longer called in question, when we daily see it proved in modern practice, that the largest aneurismal swellings are thus speedily diminished and removed, after the operation of tying the arteries, from which such tumours arise.

I wish, however, the preceding observations merely to convey a general condemnation of the practice of opening swellings containing extravasated blood; for, no surgeon is more assured, than I am myself, that there are particular exceptions, in which the plan is highly proper and necessary. Thus, whenever a case of extensive ecchymosis, or a large tumor of extravasated blood, either excites suppuration, or creates excessive pain from distention, it is better to practise a free opening. So it sometimes happens, in cases of aneurism, that the skin breaks after the artery has been tied, and some of the blood escapes; but the remainder putrefies, and soon becomes blended with purulent matter in the sac. Here the making of a free incision for the discharge of the irritating contents of the swelling will often be followed by the most beneficial effects.

**ECHINOPHTHA'LMIA.** (from *εχινος*, a hedgehog, and *οφθαλμια*, an inflammation of the eye) An inflammation of the eyelids, attended with a projection of the eyelashes, which stand out like the quills of a hedge-hog.

**ECPYE'MA.** (from *εκ* and *πυον*, *pus.*) Suppuration; an abscess.

**ECSARCO'MA.** (from *εκ* and *σαρξ*, *flesh.*) A fleshy excrescence.

**ECTROPIUM.** (from *εκτρεπω*, *to divert.*) A turning out, or an eversion of the eyelids.

Just as excessive relaxation of the skin of the eyelids, and a morbid contraction of their lining, near the edges, in consequence of ulcerations and cicatrices, occasion a faulty inclination of the tarsus and eyelashes against the eye; so, sometimes, an elongation and swelling of the membranous lining of the eyelids, or too great a contraction and shortening of the skin of the eyelid itself, or neighbouring parts, produce an opposite disorder to *trichiasis*, viz. an eversion of the eyelids, termed *ectropium*.

Of course, in respect to causes, there are two species of this disease; one, produced by an unnatural swelling of the lining of the eyelids, which not only pushes their edges from the eye-ball, but also presses them so forcibly, that they become everted; the other, arising from a contraction of the skin covering the eyelid, or of that in the vicinity, by which means the edge of the eyelid is first removed for some distance from the eye, and afterwards turned completely outward, together with the whole of the affected eyelid.

The morbid swelling of the lining of the eyelids, which causes the first species of ectropium (putting out of present consideration a similar affection incidental to old age), arises mostly from a congenital laxity of this membrane, afterwards increased by obstinate chronic ophthalmies, particularly of a scrophulous nature, in relaxed, unhealthy subjects; or else the disease originates from the small-pox affecting the eyes.

While the disease is confined to the lower eyelid, as it most commonly is, the lining of this part may be observed rising in the form of a semilunar fold, of a pale red colour, like the fungous granulations of wounds, and intervening between the eye and eyelid, which latter it in some measure everts. When the swelling is afterwards occasioned by the lining of both the eyelids, the disease assumes an annular shape, in the centre of which the eyeball seems sunk, while the circumference of the ring presses, and everts the edges of the two eyelids so as to cause both great uneasiness and deformity. In each of the above cases, on pressing the skin of the eyelids with the point of the finger, it becomes manifest, that they are very capable of being elongated, and would readily yield, so as entirely to cover the eye.ball, were they not prevented by the intervening swelling of their membranous lining.

Besides the very considerable deformity, which the disease produces, it occasions a continual discharge of tears over the cheek, and, what is worse, a dryness of the eyeball, frequent exasperated attacks, of chronic ophthalmy, incapacity to bear the light, and, lastly, opacity and ulceration of the cornea.

The second species of ectropium, or that arising from a contraction of the integuments of the eyelids, or neighbouring parts, is not unfrequently a consequence of puckered scars, produced by the confluent smallpox; deep burns; or the excision of cancerous, or encysted tumours, without saving a sufficient quantity of skin; or, lastly, the disorder is the effect of malignant carbuncles, or any kind of wound attended with much loss of substance. Each of these causes is quite enough to bring on such a contraction of the skin of the eyelids, as to draw these parts towards the arches of the orbits, so as to remove them from the eye-ball, and turn their edges outward. No sooner has this circumstance happened, than it is often followed by another one equally unpleasant, namely, a swelling of the internal membrane of the affected eye-lids, which afterwards has a great share in completing the eversion. The lining of the eye-lids, though trivially everted, being continually exposed to the air, and irritation of extraneous substances, soon swells, and rises up, like a fungus. One side of this fungus-like tumour covers a part of the eye-ball; the other pushes the eye-lid so considerably outward, that its edge is not unfrequently in contact with the margin of the orbit. The complaints, induced by this second species of ectropium, are the same as those brought on by the first; it being noticed, however, that in both cases, whenever the disease is very inveterate, the fungous swelling of the inside of the eyelids, becomes hard, coriaceous, and, as it were, callous.

Although in both species of ectropium, the lining of the eye-lids seems equally swollen, yet the surgeon can easily distinguish to which of the two species the disease belongs. For, in the first, the skin of the eye-lids, and adjoining parts, is not deformed with scars, and by pressing the everted eyelid with the point of the finger, the part would with ease cover the eye, were it not for the intervening fungous swelling. But, in the second species of ectropium, besides the obvious cicatrix and contraction of the skin of the eyelids, or adjacent parts, when an effort is made to cover the eye with the everted eyelid, by pressing upon the latter part with the point of the finger, it does not give way, so as completely to cover the globe, or only yields, as it ought to do, for a certain extent; or it does not move in the least from its unnatural position, by reason of the integuments of the eyelids having been so extensively destroyed, that their margin has become adherent to the arch of the orbit.

From a comparison of the two species of ectropium, it clearly appears, that the cure of this disease cannot be accomplished with equal perfection in both its forms, and that the second species is even in some cases, absolutely incurable. For, as in the first species of ectropium, the disease only depends upon a morbid intumescence of the internal membrane of the eyelids, and the treatment merely consists in removing the redundant portion, art possesses many efficacious means of accomplishing what is desired. But, in the second species of ectropium, the chief cause of which arises from the loss of a portion of the skin of the eyelids, or adjacent parts, which loss no known artifice can restore, surgery is not capable of effecting a perfect cure of the malady. The treatment is confined to remedying, as much as possible, such complaints as result from this kind of eversion, and this can be done in a more or less satisfactory manner, according as the loss of skin on the eyelid is little, or great. Cases, in which so much skin is deficient, that the edge of the eyelid is adherent to the margin of the orbit, are to be abandoned as incurable. *Si nimium palpebræ deest,* says Celsus, *nulla id restituere curatio potest;* (*lib.* 7. *cap.* 7.) Hence, in treating the second species of ectropium, the degree of success attending the cure, may always be estimated, by remarking to what point the eyelid admits of being replaced, on being gently pushed, with the end of the finger, towards the globe of the eye, both before and after the employment of such means as are calculated to effect an elongation of the skin of the eyelid; for, it is to this point, and no further, that art can reduce the everted part, and permanently keep it so replaced. With respect to the treatment of the first species of ectropium; when the disease is recent, the fungous swelling of the lining of the eyelid not considerable, and, consequently, the edge of the eyelid not much turned out, and in young subjects (for in old ones the eyelids are so flaccid, that the disease is irremediable) it may be cured by destroying the fungous surface of the internal membrane of the eyelid, with the argentum nitratum, which is to be done as follows:—The surgeon must evert the whole of the affected eyelid with his left hand, and with his right wipe it dry with a piece of rag. Then he is to rub the caustic forcibly over the whole surface of the fungous swelling, so as to form an eschar. And, that the patient may suffer as little as possible, an assistant is instantly to apply a little oil to the burnt part, immediately the caustic is removed, by which means the argentum nitratum will be kept from dissolving in the tears, and spreading over the eye. Should, however, any part of the caustic be dissolved, and give the patient pain, the surgeon, or attendants, must immediately wash the irritating substance away, by repeatedly bathing the eye with new milk. The cauterization is to be repeated for several days in succession, until the argentum nitratum has produced a sufficient destruction of the internal membrane of the eyelid, and of its fungous surface, particularly near the tarsus. Afterwards, bathing the eye with plain water, or barley-water, and mel. rosæ, will prove sufficient for healing the sore on the inside of the eyelid. The result of such treatment will be, that in proportion as the wound within the eyelid heals, the eversion will gradually diminish, and the edge of the eyelid at last return to its natural position.

This plan of cure can only be successfully put in practice, in cases in which the ectropium is slight and recent. To remedy the considerable and inveterate form of the first species of the disease, in an expeditious and effectual way, the quickest and safest plan is to cut away the whole of the fungous swelling, closely to the muscular substance, on the inside of the eyelid.

The patient being therefore seated, with his head a little inclined backward, the surgeon, with the index and middle finger of his left hand, is firmly to keep the eyelid everted, and holding a small pair of curved scissars, with convex edges, in his right, he is completely to cut off the whole fungosity of the internal membrane of the eyelid, as near as possible to its base. The same operation is then to be repeated on the other eyelid, should that be affected with the same disorder. If the excrescence should be of such a shape, that it cannot be exactly included within the scissars, it must be raised as much as possible, with forceps, or a double pointed hook, and dissected off at its base, by means of a small bistoury with a convex edge. The bleeding, which seems, at the beginning of the operation, as if it would be copious, stops of itself, or as soon as the eye is bathed with cold water. The surgeon is then to apply the dressings, which are to consist of two small compresses, one put on the upper, the other on the lower arch of the orbit, and over these the uniting bandage, in the form of the monoculus, or so applied as to compress and replace the edges of the everted eyelids, in order to make them cover the eye. On the first removal of the dressings, which should take place about twenty-four or thirty hours after the operation, the surgeon will find the whole, or almost the whole, of the eyelid, in its natural position. The treatment should afterwards consist in washing the ulcer on the inside of the eyelid with simple water, twice a day, or else with aqua malvæ, or barley-water, and mel. rosæ, until it is completely well. If, towards the end of the cure, the wound should assume a fungous appearance, or the edge of the eyelid seem to be too distant from the eyeball, the wound on the inside of the eyelid must be rubbed several times with the argentum nitratum, for the purpose of destroying a little more of the membranous lining, so that, when the cicatrization follows, a greater contraction of it may take place, and the edge of the eyelid be drawn still nearer the eye. However, proper steps must also be pursued, in order to resist the principal cause on which the ectropium depends, particularly, chronic ophthalmy, the relaxed and varicous state of the conjunctiva, &c. (See *Ophthalmy.*)

In the second species of ectropium, or that produced by an accidental contraction of the skin of the eyelids, or neighbouring parts, the curative indication does in no respect differ from what it is in the foregoing instance. If a contraction of the integuments has proved capable of everting the eyelid, the excision of a piece of the internal membrane of the part, and the cicatrix which will follow, must also be capable, for the same reason, of bringing back the eyelid into its natural position. But, since nothing can restore the lost skin, the shortened state of the whole eyelid, in whatever degree it exists, must always continue, even after any operation the most skilfully executed. Hence, the treatment of the second species of ectropium will never succeed so perfectly as that of the first, and the replaced eyelid will always remain shorter, than natural, in proportion to the quantity of integuments lost. It is true, that, in many cases, the eversion seems greater than it actually is, in regard to the small quantity of skin lost or destroyed; for, when the disease has once begun, though the contraction of the skin may be trivial, in consequence of the little quantity of it deficient, still the swelling of the lining of the eyelid, which never fails to increase, at last brings on a complete eversion of the part. In these cases, the cure may be accomplished with such success, as is surprising to the inexperienced; for, after the fungous swelling of the internal membrane of the eyelid has been cut off, and the edge of the part approximated to the eyeball, the shortening of the eyelid, remaining after the operation, is so trivial, that it may be considered as nothing, in comparison with the deformity and inconvenience occasioned by the ectropium. Whenever, therefore, the retraction of the skin of the everted eyelid, and the consequent shortness of it, are such, as not to prevent its rising again and covering the eye, if not entirely, at least moderately, the surgeon should cut away the internal membrane of the everted eyelid, as already explained, so as to produce a loss of substance on the inside of the everted eyelid. This may be done, as most convenient, either with the convex-edged curved scissars, or small convex-edged bistoury. In inveterate cases of ectropium, in which the tumid lining of the eyelids has become hard and callous, it is best to apply to the everted eyelid, for a few days before the operation, a soft bread and milk poultice, in order to render the part flexible, and more easily separated, than it could be in its former rigid state.

It is a most certain truth, that making a division of the cicatrices, which have given rise to the shortening and eversion of the eye-lid, does not procure any permanent elongation of this part, and consequently it is of no avail in the cure of the present disease. We see the same circumstance occur after deep and extensive burns of the skin of the palm of the hand and fingers: whatever pains may have been taken, during the treatment, to keep the hand and fingers extended, no sooner is the cicatrization thus completed, than the fingers become irremediably bent. The same thing happens after extensive burns of the skin of the face and neck. Fabricius ab Aquapendente, who well knew the inutility of making a semilunar cut in the skin of the eyelids, for the purpose of remedying their shortening and eversion, proposes, as the best expedient, to stretch them with adhesive plasters, applied to them and the eyebrow, and tied closely together. Whatever advantage may result from this practice, the same degree of benefit may be derived from using, for a few days, a bread and milk poultice, afterwards oily embrocations, and, lastly, the uniting bandage, so put on as to stretch the shortened eyelid, in an opposite direction to that produced by the cicatrix. This practice should always be carefully tried, before resorting to the operation.

The patient being seated, if an adult, or placed on a table with his head a little elevated, and held by proper assistants, if a child, the surgeon, with a small convex-edged bistoury, is to make an incision of sufficient depth into the internal membrane of the eyelid, along the tarsus, carefully avoiding the situation of the puncta lachrymalia. Then he should raise with a pair of forceps, the flap of the divided fungous membrane, and continue to detach it, with the bistoury, from the subjacent parts, all over the inner surface of the eyelid, as far as where the membrane quits this part, to be reflected over the front of the eye, under the name of *conjunctiva.* The separation being thus far accomplished, the membrane is to be raised still more with the forceps, and cut off with one, or two strokes of the scissars, at the lowest part of the eyelid.

The compresses and bandage, to keep the eyelid replaced, are to be applied, as above directed. On changing the dressings, a day, or two, after the operation, the eyelid will be found, in a great measure, replaced, and the disfigurement, which it caused, greatly amended. The operation is rarely followed by bad symptoms, such as vomiting, violent pain, and inflammation. However, should they occur, the vomiting may be relieved by means of an opiate clyster, and, as for the pain and inflammation, attended with great tumefaction of the eyelid operated upon, these complaints may be cured by applying a poultice, or bags filled with emollient herbs, at the same time employing internal antiphlogistics, until the inflammation and swelling have subsided, and suppuration has commenced on the inside of the eyelid, on which the operation has been done. After this, the treatment is to consist in washing the part, twice a day, with barley-water and mel. rosæ, and, lastly, in touching the wound a few times with the argentum nitratum, in order to keep the granulations within certain limits, and to form a permanent cicatrix, proper for maintaining the eyelid replaced. (*Scarpa sulle Malattie degli Occhi.*)

In cases, in which the eversion is considerable, Sir W. Adams has never found the simple incision of the fungus, as practised by Scarpa, sufficient to effect a radical cure, and he therefore tried a new mode of operating. In his first attempts, he employed a very small curved bistoury, the point of which he carried along the inside of the eyelid, at its outer angle, downwards and outwards, as far as the point of reflection of the conjunctiva would admit. He then pushed it through the whole substance of the everted eyelid and its integuments, and cut upwards through the tarsus, making an incision nearly half an inch in length. With a curved pair of scissars, he next snipped off a piece of the edge of the tarsus, about one third of an inch in width, and he afterwards removed with the same instrument the whole of the diseased conjunctiva. When the bleeding had ceased, Sir W. Adams passed a needle and ligature through the whole substance of the two divided portions, and brought them as accurately into contact as possible. Finding, however, that too much integument had been left at the lower part of the incision, he employed, in future operations, instead of the scalpel, a pair of straight scissars, with which he cut out an angular piece of the lid, resembling the letter V. Latterly, Sir W. Adams has found it advantageous to leave about a quarter of an inch of the lid adjoining its external angle, and after shortening the part as much as necessary, he brings the edges of the incision together with a suture. (*See Practical Observations on the Ectropium, &c. by W. Adams, p. 4 and 5, Lond.* 1812.)

On the subject of the foregoing proposal, M. Roux observes: " What Sir W. Adams says, with a view of enhancing the value of his own method, about the frequent recurrence of ectropium, when the conjunctiva is simply cut out, is a gratuitous assertion, contradicted by experience. I have already, in a very great number of cases, undertaken the cure of ectropium in the common way: the operation always succeeded as much as the degree, or other circumstances, of the disease allowed; and I have not yet observed an instance of a relapse." (*Relation d'un Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 291.) If this new operation, however, will cure the ectropium, caused by the contraction of cicatrices, as its inventor describes, it is clear, that, though it may not be necessary in ordinary cases, its usefulness will not be entirely lost. The contracted scar must of course be divided, in addition to the other proceedings.

For information on *Ectropium,* consult *Scarpa's Osservazioni sulle Malattie degli Occhi, to which writer I am indebted in the preceding account of the disease. Richter's Anfangsgr. der Wundarzneykunst, Band* 2, *p.* 473, *&c. Wenzel's Manuel de l'Oculiste. Pellier, Recueil d'Obs. sur les Maladies des Yeux. Sir W. Adams' Pract. Observ. on Ectropium, &c. M. Bordenave's " Mémoire dans lequel on propose un nouveau procédé pour traiter le renversement des Paupieres," in Mém. de l'Acad. Royale de Chirurgie, T.* 13, *p.* 156 *et seq. Edit.* 12*mo. It was in this memoir, that the proposal of removing a portion of the inside of the eyelid for the cure of ectropium was first made, and its efficacy illustrated by facts. Here may also be found the best historical account of the different methods of treatment, which have prevailed from the earliest periods of surgery. Consult also Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, par P. J. Roux, p.* 289—292; *Paris,* 1815.

**ECZEMA**, or **Eczésma** (from εκζεω, to boil out.) A hot painful eruption, or pustule. Mr. Pearson calls the erythéma mercuriale, *eczéma mercuriale.* (See *Mercury.*)

**EFFUSION.** (from *effundo,* to pour out.) In surgery, means the escape of any fluid out of the vessel, or viscus, naturally containing it, and its lodgment in another cavity, in the cellular substance, or in the substance of parts. Thus, when the chest is wounded, blood is sometimes effused from the vessels into the cavity of the pleura; in cases of false aneurisms, the blood gets out of the artery into the interstices of the cellular substance; in cases of fistulæ in perineo, the urine gets from the bladder and urethra into the cellular membrane of the perineum and scrotum; and, when great violence is applied to the skull, blood is often effused even in the very substance of the brain.

Effusion also sometimes signifies the natural secretion of fluids from the vessels: thus surgeons frequently speak of the coagulable lymph being effused on different surfaces. (See *Extravasation.*)

**ELECTRICITY.** The following account of this subject, as it relates to surgery, is extracted from a work, that abounds with useful information, and has long been out of print: I mean the Pharmacopoeia Chirurgica, by an anonymous writer.

Among the aids of surgery, electricity once held a conspicuous and important situation. It has, however, met with a fate, not unusual with remedies too much cried up and too indiscriminately employed; that of having fallen, in a great degree, into neglect.

Whatever its effects, however, on the system may be, it certainly possesses this advantage over other topical remedies, that it may be made to act on parts very remote from the surface. By its application in repeated *shocks*, we are sometimes able to restore the action of those nerves, whose diseases may have impaired the senses; and by its use in the way of *friction*, or by drawing *sparks*, complaints of a more superficial nature are removed.

According to Mr. Birch "the applications of the electric fluid to the diseases of the human body, may be all comprised under three heads. 1st. Under the form of *radii*, when projected from a point. 2d. That of a *spark*, when many of these radii are concentered on a ball. 3d. Under that of a *globe*, when many of these sparks are condensed in a Leyden jar." (See *Adams's Essay on Electricity.*)

Under the first form, electricity is very advantageously applied, in inflammation of the eye, or any other highly sensible part.

Under the second, its action may be serviceable, in cases where the common skin can be stimulated with less reserve; as in local inflammations, sprains, bruises, contractions, tumours, paralytic affections, &c.

In the way of repeated shocks, it is likewise of service in the same cases; and is usually employed alternately with the other forms of electricity.

The electrical fluid, as a topical remedy, has been chiefly confined to the following diseases; viz. superficial inflammation, ophthalmia, gutta serena, deafness, scrofulous enlargements, anomalous tumours, ulcers, cutaneous eruptions, cancers, and abscesses.

Instances are upon record, of its success, in *suddenly* restoring the sight in gutta serena, the hearing in deafness, and the speech in dumbness, even of many years continuance. It is indeed the performance of a *miracle* of this sort *now and then*, that has led us to expect, what however no practitioner ever has found in it, a remedy, *uniform in its good effects.* It is peculiar perhaps to electricity, that it will sometimes do what is not at all expected from it, whilst, on the other hand, it is continually disappointing us in our common intentions. Perhaps the most accurate way in which we can speak of electricity as a remedy in local affections is that suggested by Mr. Abernethy, viz. that it has a tendency to promote *whatever action or process happens to be going on in a diseased part at the time of its application.*

Amongst the means employed to restore the vital functions, in cases of hanging, drowning, &c. electricity possesses a considerable share of importance; since, by proper management, the heart, lungs, brain and nerves, &c. may be subjected to its salutary stimulus. But its success in this, and indeed every instance, will depend on the perfection of the apparatus employed, and the judgment of the operator in directing the force of the electric fluid.

In the *venereal disease*, electricity is said to be injurious; for what reason, has never yet been satisfactorily explained; neither indeed, is the fact itself well ascertained. It ought to be observed, however, that there is a great singularity attending its use in those persons who are under the effects of a mercurial course. In these, the shock, or even the spark, is attended with considerable more pain than in common instances; and Mr. Hunter mentions the case of a person on whose complaint electricity had no effect, *till* mercury was administered, after which the same remedy produced a cure.

The discoveries of Galvani on the peculiar electricity of animal bodies, may possibly throw some light, in the course of time, on the *modus operandi* of the electrical fluid. At present, we are not acquainted with its properties, farther than the evidence we possess of its action as a stimulant. (*Pharm. Chirurg.*)

**ELEVATOR.** An instrument for raising depressed portions of the skull.

Besides the common elevator, now generally preferred by all the best operators, several others have been invented; as, for instance, the tripod elevator, and another, which was first devised by M. J. L. Petit, and afterwards improved by M. Louis.

The common elevator is an exceedingly simple kind of instrument, being in fact a mere lever, the end of which is somewhat bent, and made rough, in order that it may be less apt to slip away from the piece of bone, which is to be raised. This instrument may be used by forming a fulcrum for it, either in the hand, which holds it, or upon the fingers of the other hand; or the operator may make a fixed point for it on the edge of the opening made with the trephine, or of that, which the accidental violence has occasioned. In the first case, it has been objected, that the instrument cannot be employed with much force; the hand may give way; or, the elevator may slip from the bone, against which it presses, and thus produce a considerable concussion. In the second case, it is objected, that the part, on which the instrument is placed, may be forced inward.

Such were the reasons, which led to the invention of the tripod elevator, one piece of which consists of three branches uniting above into one common trunk. This last part of the elevator is pervaded by a long screw, having below a kind of hook, and above a sort of handle for turning it. It is with the hook, that the depressed portion of bone is to be elevated. It is to be introduced into the opening made in the cranium, as soon as the elevator has been put in a proper position; and it is to be made to ascend by turning the screw. Formerly, the tripod elevator was also sometimes used conjointly with a sort of screw, which was first fixed in the piece of bone about to be elevated, and then drawn upward, by placing the hook in a ring, that was attached to its upper part.

The inventors of the tripod elevator were certainly very well acquainted with the imperfections of the common one; and they endeavoured to obviate them, by procuring a firmer fulcrum, and a greater degree of power. But, it was necessary to change the situation of their elevator, as often as there was occasion to raise a different portion of bone; and the hook also being connected with an inflexible piece of steel, the direction of which was always the same as that of the instrument, it became troublesome and difficult to place the hook under the piece of bone, which stood in need of being raised.

These inconveniences caused M. J. L. Petit to invent a new elevator. This consisted of a lever, mounted on a handle, and straight throughout its whole length, except just at its very end, which was slightly curved, in order that it might be more conveniently put under the portion of bone, which was about to be elevated. The lever was pierced at various distances from its bent end, with several holes, intended for the reception of a little kind of moveable screw-peg, which was fixed upon the top of a sort of bridge. This latter part of the instrument consisted of a kind of arch, the ends of which were long and covered with small pads, while, on its centre, was placed the little screw-peg already mentioned. It was the intention of M. Petit, that the peg should be joined to the bridge by means of a hinge; and as he found that it was frequently necessary to elevate several different pieces of bone, he thought, that the peg should not be completely fastened in the hole, but that it should be capable of being moved about in any wished for direction. With this construction, however, it was found, that the peg would only allow the lever to be applied with its edge obliquely, under the bone about to be raised, when the part of the cranium was situated to the right, or left.

M. Louis conceived, that it would be a great improvement of Petit's elevator, if a sort of pivot were substituted for the hinge. The lever would then admit of being readily moved in every direction, and put under any point of bone, without any occasion to alter the position of the bridge or fulcrum.

I have only to add, respecting elevators for fractures of the skull; that all the best modern surgeons content themselves with the common one, which is most simple, and, in the hands of a surgeon, who knows how to use it, is found to answer every desirable purpose.

**ELYTROCELE.** (from *ελυτρον*, the vagina, and *κηλη*, a tumour.) A hernia in the vagina.

**EMBROCATIO ALUMINIS.** ℞. Aluminis ℥ij. Aceti spiritûs vinosi tenuioris, sing. ℔ss. For chilblains, and diseased joints.

**EMBROCATIO AMMONIÆ.** ℞. Embrocat. ammon. Acet. cum sapone ℥ij. Aq. ammon. pur. ℥ij. M. For sprains and bruises.

**EMBROCATIO AMMONIÆ ACETATÆ CAMPHORATÆ.** ℞. Solut. saponis cum camphorâ, Aq. ammon. acet. sing. ʒj. Aq. ammon. pur. ℥ss. M. For sprains and bruises. It is also frequently applied to disperse chilblains, which have not suppurated. Said to be the same as Steers's opodeldoc.

**EMBROCATIO AMMONIÆ ACETATÆ.** ℞. Aq. ammon. acet. Solut. sapon. sing. ℥j. M. For bruises with inflammation.

**EMBROCATIO CANTHARIDIS CUM CAMPHORA.** ℞. Tinct. cantharidis. Spirit. camph. sing. ʒj. M. This may be used in any case, in which the object is to stimulate the skin. The absorption of cantharides, however, may bring on a strangury.

**EMBRYOTOMIA.** (from *εμβρυων*, a fœtus, and *τεμνω*, to cut.) The operation of cutting into the womb, in order to extract the fœtus. (See *Cæsarean Operation.*)

**EMOLLIENTS.** (from *emollio*, to soften.) Applications, which have the property of softening and relaxing parts.

**EMPHYSEMA.** (from *εμφυσαω*, to inflate.) A swelling produced by air being diffused in the cellular substance.

The common cause of this affection is a fractured rib, by which the vesicles of the lungs being wounded, the air escapes through them into the cavity of the thorax. But, as the rib on being fractured, and pushed inwards, wounds the pleura, which lines the ribs and intercostal muscles, part of the air most commonly gets through the pleura, and those lacerated muscles into the cellular membrane, which is on the outside of the chest, and thence it is diffused through the same membrane over the whole body, so as to inflate it sometimes to an extraordinary degree. This inflation of the cellular membrane has been commonly looked upon, as the most dangerous part of the disease; how justly, will appear in the sequel. (*Hewson, Med. Obs. and Inquiries, Vol.* 3.)

Emphysema is most frequent after a fractured rib, because there is, in this instance a wide laceration of the lungs, and no exit for the air; it is less frequent in large wounds with a knife, or broad sword, because the air has an open and unimpeded issue; it is again more frequent in deep stabs with bayonets, or small swords; and it is peculiarly frequent in gun-shot wounds, because the orifice in the skin inflames, and swells, while the wound is wider within. (*John Bell on Wounds of the Breast.*)

The symptoms, attending emphysema, are generally of the following kind. The patient at first complains of a considerable tightness of the chest, with pain, chiefly in the situation of the injury, and great difficulty of breathing. This obstruction of respiration gradually increases and becomes more and more insupportable. The patient soon finds himself unable to lie down in bed, and cannot breathe, unless when his body is in an upright posture, or he is sitting a little inclined forward. The countenance becomes red and swollen. The pulse, at first, weak and contracted, becomes afterwards irregular. The extremities grow cold, and, if the patient continue unrelieved, he soon dies, to every appearance suffocated.

The emphysematous swelling, wheresoever situated, is easily distinguished from œdema, or anasarca, by the crepitation, which occurs on handling it, or a noise, like that which takes place on compressing a dry bladder half filled with air. (*Encyclopédie Méthodique; Partie Chirurgicale, Art. Emphysema.*)

The tumour is colourless and free from pain. It does not of itself descend into depending parts, though by pressure it may be made to change its situation. It is elastic, that is to say, it may be pressed down, but it rises up again as soon as the pressure is discontinued. The swelling never retains the impression of the end of the finger, or, in the language of surgery, never *pits.* The part affected is not heavy. The tumor first makes its appearance in one particular place; but, it soon extends itself over the whole body, and causes an extraordinary distention of the skin. (*Richter's Anfangsgr. der Wundarzneykunst, B.* 1, *p.* 451.)

The wound of the pleura and intercostals may sometimes be too small to suffer the air to get readily into the cellular membrane, and to inflate it, but may confine a part of it in the cavity of the thorax, so as to compress the lungs, prevent their expansion, and cause the same symptoms of tightness of the chest, quick breathing, and sense of suffocation, which water does in the hydrops pectoris, or matter in the empyema. (*Hewson.*)

To understand, why the air passes at all out of the wound of the lungs, we must advert to the manner, in which inspiration and expiration are naturally carried on. It is well known, that in the perfect state, the surface of the lungs always lies in close contact with the membrane lining the chest, both in inspiration and expiration. The lungs themselves are only passive organs, and are quite incapable, by any action of their own, to expand and contract, so as to maintain their external surface constantly in contact with the inside of the thorax, which is continually undergoing an alternate change of dimensions. Every muscle, that has any concern in enlarging and diminishing the capacity of the chest, must contribute to the effect of adapting the volume of the lungs to the cavity, in which they are contained, as long as there is no communication between the cavity of the pleura, and the external air. In inspiration, the thorax is enlarged in every direction, the lungs are expanded in the same way, and the air entering through the wind-pipe into the air-cells of these organs, prevents the occurrence of a vacuum.

But, in cases of wounds, when there is a free communication between the atmosphere and inside of the chest, on this cavity being expanded, the air naturally enters it at the same time, and for the same reasons, that the air enters the lungs through the trachea, and the lung itself remains proportionally collapsed. When the thorax is next contracted, in expiration, the air is compressed out of the lung, and also, out of the bag of the pleura, through the external wound, if there be a direct one. In the latter circumstance, the emphysematous swelling is never very extensive.

But, in the case of a fractured rib, attended with a breach in the pleura costalis, pleura pulmonalis, and some of the air-cells of the lungs, there is no direct communication between the cavity of the chest and the external air; in other words, there is no outward wound in the parietes of the thorax. There is, however, a preternatural opening formed between the air-cells of the lungs and the cavity of the chest, and also another one between the latter space, and the general cellular substance of the body, through the breach in the pleura costalis. The consequence is, that, when the chest is expanded in inspiration, air rushes from the wound in the surface of the lungs, and insinuates itself between them and the pleura costalis. The lungs collapse in proportion, and the place, which they naturally occupied, when distended, is now occupied by the air. When, in expiration, the dimensions of the chest are every where diminished, the air, now lodged in the bag of the pleura, cannot get back into the aperture in the collapsed lung, because this is already full of air, and is equally compressed on every side, by that which is confined in the thorax. Were there no breach in the pleura costalis, this air could not now become diffused; the muscles of inspiration would next enlarge the chest, remove the pressure from the surface of the wounded lung, more air would be sucked out of it, as it were, into the space between the pleura costalis and pleura pulmonalis, and this process would go on, till the lungs of the wounded side were completely collapsed. But, in the case of a fractured rib, or of a narrow stab, in which there is also a breach in the pleura costalis, without any free vent outward, for the air, which gets out of the lung into the cavity of the pleura, as soon as the expiratory powers lessen the capacity of the chest, this air, not being able to get back through the breach in the collapsed lung, passes through the laceration, or wound, in the pleura costalis, into the common cellular substance.

It is through the communicating cells of this structure, that the air becomes diffused most extensively over the whole body, in proportion as the expiratory muscles continue in their turn to lessen the capacity of the chest, and pump the air, as it were, through the breach in the pleura costalis, immediately after it has been sucked, as it were, out of the wound in the lung, in inspiration. (See *John Bell on Wounds of the Breast, and Halliday on Emphysema,* 1807.)

To prove that the confinement of air in the chest is the cause of the dangerous symptoms attending emphysema, Mr. Hewson adverts to the histories of some most remarkable cases, published by M. Littre, M. Mery, Dr. Hunter, and Mr. Cheston. (See *Mem. de l'Acad. Royale des Sciences, for* 1713. *Med. Observations and Inquiries, Vol.* 2, *and Pathological Inquiries.*)

In M. Littre's case, the patient, who had been wounded in the side with a sword, could not breathe, without making the most violent efforts, especially, during the latter part of his disease: he died on the fifth day.

In M. Mery's case, a man had the fourth and fifth true ribs broken by a coach passing over his chest, his respiration was much impeded from the first, and became more and more difficult, till he died, which was on the fourth day after the accident.

In Dr. Hunter's case, the patient had received a considerable hurt on his side by a fall from his horse. He had a difficulty of breathing, which increased in proportion as the skin became elevated and tense; it was laborious as well as frequent. His inspiration was short, and almost instantaneous, and ended with a catch in the throat, which was produced by the shutting of the glottis: after this he strained to expire for a moment without any noise, then suddenly opening the glottis, he forced out his breath with a sort of groan, and in a hurry, and then quickly inspired again; so that his endeavours seemed to be to keep his lungs always full; inspiration succeeded expiration as fast as possible. He said, his difficulty of breathing was owing to an oppression or tightness across his breast, near the pit of the stomach. He had a little cough, which exasperated his pain, and he brought up blood and phlegm from his lungs. He was relieved by scarifications, and recovered.

In Mr. Cheston's case, the man had received a blow on the chest. He had a constant cough, bringing up, after many ineffectual efforts, a frothy discharge, lightly tinctured with blood; he seemed to be in the greatest agonies, and under a constant appearance of suffocation. His pulse was irregular, and sometimes scarcely to be felt, his face livid, and, when he was sensible, which was only now and then, he complained of a pain in his head. On passing a bandage round his chest, with a proper compress to prevent the discharge of air into the cellular membrane, and to confine the motion of the thorax, the patient cried out, that he could not suffer it. A strong compression by the hand alone affected him in the same way. Notwithstanding bleeding, repeated scarifications, and other means, his sense of suffocation, and difficulty of breathing increased. On the fourth day, the air no longer got into the cellular membrane, when on a sudden inclining his head backward as it were, for the admission of more air, than usual, his breathing became more difficult and interrupted, he turned wholly insensible, and soon afterwards died.

M. Littre, M. Mery, and Mr. Cheston, opened their patients after death.

M. Littre, besides a wound of the lungs and fractured rib, found a considerable quantity of blood in the cavity of the thorax, and was sensible of some putrid air escaping, on his first puncturing the intercostals and pleura. The wounded lobe was hard and black, and the other two of the same side were inflamed.

In M. Mery's patient, no blood was extravasated, nor was there any thing preternatural, except the fractured ribs, the wound of the pleura, and that of the lungs.

Mr. Cheston found a fracture of the tenth and eleventh ribs, and a wound of the lungs. The lungs, below the wound, were livid, and more compact, than usual; but every thing else was natural, no extravasation, no inflammation, no internal emphysema.

Mr. Hewson made experiments on animals to shew, that air in their chests produced great difficulty in breathing, such as occurs in cases of emphysema, and in one case, which he examined after death, air was actually discharged on puncturing the thorax.

The object of Mr. Hewson's paper is to recommend making an opening into the chest, for the purpose of giving vent to the air confined in that cavity, just as is done for the discharge of pus, in cases of empyema, and water, in those of hydrops pectoris.

In wounds of the lungs, says this author, whether occasioned by fractured ribs, or other causes, when symptoms of tightness and suffocation come on, so far should we be from dreading the emphysematous swelling of the cellular membrane, that we should rather consider it, as a favourable symptom, shewing that the air is not likely to be confined in the thorax; and so far should we be from compressing the wound to prevent the inflation, or emphysema, that we should rather dilate it (if not large enough already), or perform the paracentesis thoracis. We may judge of the necessity of this operation from the violence of the symptoms, such as the oppressed breathing, &c. For when these are not considerable, and the air gets out of the chest with sufficient freedom, the operation then becomes unnecessary.

The best place for performing the operation, says Mr. Hewson, if the disease is on the right side, will be on the fore-part of the chest, between the fifth and sixth ribs; for, there the integuments are thin, and, in the case of air, no depending drain is required. But, if the disease is on the left side, it will be more advisable to make the opening between the seventh and eighth, or eighth and ninth ribs, that we may be sure of avoiding the pericardium. As large penetrating wounds are inconvenient on account of the air entering by the aperture in such a quantity, *as to prevent the expansion of the lungs*, a small wound will be eligible, and especially as air does not require a large one for its escape. Mr. Hewson recommends dissecting cautiously with a knife, in preference to the coarse and hazardous method of thrusting in a trocar.

There is one error, prevailing in Mr. Hewson's paper, for which he has been justly criticized by Mr. John Bell; viz. the idea, that it is possible and proper to make the collapsed lung expand by making an opening into the chest, in cases of emphysema. Bromfield and B. Bell have both imbibed the same erroneous opinions, and proposed plans for exhausting the air and expanding the lung. It is very certain, that it is impracticable to make the collapsed viscus expand, until the breach in it is closed, and this closure is greatly promoted by the quiet state, in which the collapsed lung remains; a state, also, the most favourable for the stoppage of any bleeding from the pulmonary vessels.

The true object then of making an opening into the thorax, when the symptoms of suffocation are very violent in cases of emphysema, is not to obtain an expansion of the lung on the affected side, nor to take the pressure of the air from it; but, to remove the pressure caused on the opposite lung by the distention of the mediastinum, and, at the same time, to diminish the pressure of the air on the diaphragm. The lung on the affected side must continue collapsed, and it is most advantageous, that it should do so. The opposite lung is that, which for a time must of itself carry on respiration, and it is known to be fully adequate to this function, provided the quantity of air, on the other side of the chest, does not produce too much pressure on the mediastinum, and diaphragm.

Mr. John Bell concludes his remarks on this subject, with advising the following practice. 1st. Upon observing the crackling tumour beginning to form itself over a fractured rib, you should make small punctures with the point of a lancet, as in bleeding; and if the point be struck deep enough, the air will rush out audibly. But, as this air was in the thorax, before it came into the cellular substance, it is plain, that the thorax is still full, and that the lung of that side is already collapsed and useless, and must continue so. The purpose, therefore, of making these scarifications, and, especially, of making them so near the fractured part, is not to relieve the lungs, but, merely, to prevent the air spreading more widely beneath the skin.

2nd. If, before you arrive, the air shall have spread to very remote parts of the body, as to the scrotum, and down the thighs, it will be easier to make small punctures in those parts, to let out the air directly, than to press it along the whole body, till you bring it up to the punctures made on the chest, over the wounded part.

3rd. If, notwithstanding free punctures, and pressing out the air in this way, you should find by the oppression, that either air, or blood, is accumulating within the cavity of the thorax, so as to oppress not the wounded lung only, which was of course collapsed and useless from the first, but so as to oppress also the diaphragm, and through the diaphragm to affect also the sound lung; then a freer incision must be made, through the skin and muscles, and a small one delicately into the thorax to let out the confined air, or blood. (*John Bell.*)

After a few days, the wound, in the collapsed lung, becomes closed by the adhesive inflammation around it, so that the air no longer gets out of it into the cavity of the chest, and any extensive opening may be healed. What air is already there is ultimately absorbed, and the lung, expanding in proportion, resumes its original functions. Emphysema has been known to arise from the bursting of a vomica, and ulceration of the surface of the lungs; but, the air, which escapes, in this instance, cannot find its way into the cavity of the thorax, because the inflammation, which precedes the abscess and ulceration of the air-cells, closes those which are adjacent, and produces an adhesion of the edges of the vomica, or ulcer, to the inner surface of the chest, so as entirely to separate the two cavities. We are not acquainted with any instance of the symptoms, imputed to the confinement of air in the chest, orginating from suppuration and ulceration of the surface of the lungs; but, Palfyn, Dr. Hunter, and the author of the article *Emphysema*, in the Encyclopédie Méthodique, Partie Chirurgicale, have seen cases, in which emphysema originated from abscesses of the lungs, attended with adhesion to the pleura, and ulcerations in the situation of such adhesion. In these instances, the pus having made its way through the pleura and intercostal muscles, the air escapes also through the same track, so as to get into the cellular membrane on the outside of the chest.

A violent effort of respiration has, sometimes, produced a certain degree of emphysema, which first makes its appearance about the clavicles, and afterwards spreads over the neck and adjacent parts. The efforts of labour have been known to occasion a similar symptom; but, no bad consequences followed. (*Medical Communications, p.* 176, *and Wilmer's Obs. in Surgery, p.* 143.)

M. Louis has described an emphysema of this sort, which, on account of its cause, and the indication, which it furnishes to the practitioner, is highly important. This famous surgeon had occasion to remark it in a young girl, who died suffocated, from a bean falling into her windpipe, and he considers it, as a pathognomonic symptom of such an accident, concerning the existence of which it is so essential not to commit any mistake. (See *Bronchotomy.*) This emphysema made its appearance on both sides of the neck, above the clavicles, and came on suddenly, on the third day after the accident. The inspection of the body proved, that the lungs and mediastinum were also in an emphysematous state. The retention of the air, confined by the foreign body, produced, says M. Louis, at each attempt to expire, and, especially, when the violent fits of coughing occurred, a strong propulsion of this fluid towards the surface of the lung, into the spongy substance of this viscus. Thence, the air passed into the cellular texture, which unites the surface of the lung to the pleura pulmonalis; and, by communications from cells to cells, it caused a prodigious swelling of the cellular substance, between the two layers of the mediastinum. The emphysema, increasing, at length made its appearance above the clavicles. This tumefaction of the lung, and surrounding parts, in consequence of air getting into their spongy, and cellular texture, is an evident cause of suffocation, and, the swelling seems so natural an effect of the presence of a foreign body in the trachea, that one can hardly fail to think it an essential symptom, though no author has made mention of it. (*Mémoires de l'Acad. de Chirurgie, Tom.* 4, *in* 4*to.*)

An emphysematous swelling of the head, neck, and chest, has also been noticed in typhoid fevers. Dr. Huxham relates an instance, of this sort, in a sailor of a scorbutic habit. (*Medical Observations and Inquiries, Vol.* 3. *Art.* 4.) A case of spontaneous emphysema has likewise been described by Dr. Baillie. (See *Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol.* 1, *p.* 202.)

A curious example of what has been called, a spontaneous emphysema, is recorded by Mr. Allan Burns: "The patient was a strong athletic man, who, about six years previous to his application at the Royal Infirmary, had received a smart blow on the neck, from the keel of a boat. This injury was soon followed by the formation of a firm tense tumour, on the place, which had been hurt. The swelling increased very slowly, during the five years immediately succeeding its commencement; but, during the sixth, it received a very rapid addition to its bulk. At this time, it measured nearly six inches in diameter, seemed to be confined by a firm and dense covering, and the morbid parts had an obscure fluctuation. From the first to the last, the tumour had been productive of very little pain.

"Judging from the apparent fluctuation, that the tumour was encysted, it was resolved, at a consultation, to puncture the swelling, draw off its contents, and then pass a seton through it. By plunging a lancet into it, only a very small quantity of blood, partly coagulated, and partly fluid, was discharged,—a quantity so trifling, that, after its evacuation, the size of the tumour was not perceptibly reduced. A seton was passed through the swelling. At this time, the man was in perfect health.

"About ten hours after the operation, the patient was seized, with extremely violent rigors, followed by heat, thirst, pain in the back, excessive pain in the tumours, and oppressive sickness.

"An emetic was prescribed, but, instead of producing vomiting, it operated as a cathartic. To remove the irritation the seton was withdrawn. The pain in the tumour, however, and the general uneasiness continued to increase, and thirty hours subsequent to making the puncture, air began to issue from the track of the seton; and, afterwards the cellular membrane of the neck, and of the other parts of the body in succession, became distended with a gaseous fluid. In the course of a few hours, after the commencement of the general emphysema, the man died.

"Twelve hours after death, when the body was free from putrefaction, it was inspected. The emphysema was neither increased, nor diminished since death, and some idea may be formed of its extent, when the scrotum was distended to the size of the head of an adult. Even the cavities of the heart, and the canals of the blood-vessels, contained a considerable quantity of air. We could discover no direct communication between the tumour and the trachea or lungs, although such was carefully sought for." (*A. Burns on the Surgical Anatomy of the Head and Neck*, *p.* 51—53.)

From such cases, we may infer, with the preceding writer, that from the mere rupture of a few of the bronchial cells, occasioned by irregular action of the lungs, or by some other internal cause, a spontaneous diffusion of air may take place in the cellular texture of the body. Such examples are dependent on the same cause as the emphysema from injury of the lungs; only the rupture of the bronchial cells in the former cases is less obvious.

Surgeons often observe a partial emphysema, in cases of gangrene.

Here, however, it is hardly necessary to observe, the air is the product of putrefaction, and the disorder has not the smallest connexion with any injury, or disease of the air-cells of the lungs.

The reader may consult, with advantage, *l'Encyclopédie Méthodique, Partie Chirurgicale. Hewson's Paper in Medical Observations and Inquiries, Vol.* 3. *Mem. de l'Acad. Royale des Sciences, for* 1713. *Dr. Hunter in Medical Observations and Inquiries, Vol.* 2. *Cheston in Pathological Inquiries. A Case in Abernethy's Works. Richter Von der Windgeschwulst, in Anfangsgr. der Wundarzneykunst, Band* 1, *p.* 451, *&c. John Bell on Wounds of the Breast. Halliday on Emphysema,* 1807. *Allan Burns on the Surgical Anatomy of the Head and Neck, p.* 52, *&c. Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol.* 1, *p.* 262. *Wilmer's Observations in Surgery, p.* 143. *Richerand's Nosographie Chirurgicale, Tom.* 4, *p.* 164, *Edit.* 2. *Lassus Pathologie Chirurgicale, Tom.* 2, *p.* 321, *&c. Edit.* 1809.

**EMPLASTRUM AMMONIACI CUM ACETO.** ℞. Ammoniaci ℥ij. Aceti Distillati ℥iij. Ammoniacum in aceto liquefactum evapora in vase ferreo ad emplastri crassitudinem.

**EMPLASTRUM AMMONIACI SCILLITICUM.** ℞. Gumm. ammoniaci ℥j. Aceti Scillitici, q. s. ut fiant emplastrum, quò pars affecta tegatur.

Mr. Ford has found this last plaster useful in some scrofulous affections. It may be rendered more stimulating by sprinkling it with squills. (*Ford on the Hip-joint, p.* 59.) It has been recommended by Swediaur; *London Medical Journal, Vol.* I. *p.* 198.

The first plaster partakes of the same stimulating property, though in a milder degree.

**EMPLASTRUM AMMONIACI CUM HYDRARGYRO.** Discutient.

**EMPLASTRUM AMMONIACI CUM CICUTA.** ℞. Gum. ammon. ℥iij. Succi cicutæ spissatæ ʒij. Aq. litharg. acet. ʒj.

Dissolve the ammoniacum in a little vinegar of squills, then add the other ingredients, and boil them all slowly to the consistence of a plaster. This is discutient.

**EMPLASTRUM AMMONIÆ.** ℞. Sapon. ʒij. Emplastr. litharg. ℥ss. Ammon. mur. ʒj.

The two first articles are to be melted together, and when nearly cold, the muriated ammonia, finely powdered, is to be added. Its use is to stimulate the skin, and excite the action of the absorbents. Hence, it disperses many chronic swellings and indurations.

**EMPLASTRUM CANTHARIDIS VEL LYTTÆ.** (See *Blister.*)

**EMPLASTRUM GALBANI COMPOSITUM. L. P.** (*Olim emplastrum lithargyri comp.*) Properties discutient.

EMPLASTRUM HYDRARGYRI. L. P. (*Olim emplastrum litharg. cum hydrargyro.*) Properties discutient.

EMPLASTRUM LYTTÆ. L. P.—(See *Blister.*)

EMPLASTRUM PLUMBI. L. P.—(*Olim emplastrum lithargyri, or diacholon plaster.*)

EMPLASTRUM RESINÆ. L. P.—(*Olim emplastrum lithargyri cum resina.*) The common adhesive, or sticking plaster.

EMPLASTRUM SAPONIS. The plaster commonly used for fractures. It is also frequently applied to bruised parts, and to many indurations of a chronic nature.

EMPYE'MA. (from εν, within, and πυον, pus, or matter.) A collection of purulent matter in the cavity of the chest.

The ancients made use of the word, "empyema" to express every kind of internal suppuration. It was Ætius, who first restricted the term to the collections of matter, which sometimes form in the cavity of the pleura, or membrane lining the chest; and all the best modern surgeons invariably attach this meaning alone to the expression.

The operation for empyema properly means the making of an opening into the thorax, for the purpose of giving vent to the matter, collected in the cavity of the pleura, though the phrase with several writers denotes making an incision into the chest, in order to let out any effused, or confined fluid, whether matter, blood, an aqueous fluid, or even air. The necessity for having recourse to such an operation, however, does not often present itself. I would not wish to be supposed to assert, that inflammation of the lungs, pleura, mediastinum, diaphragm, and even of the liver, does not sometimes terminate in suppuration. Certainly, the latter event is occasionally produced; but, when it does happen, the matter does not always make its way into the cavity of the chest. Very frequently external abscesses form, or the pus is either coughed up, or discharged with the stools.

When the surface of the lungs and that of the pleura costalis have become adherent to each other, in the situation of the abscess, the pus, always disposed by a law of nature to make its way to the surface of the body, occasions ulceration of the intercostal muscles, and collects on the outside of them. An abscess of this kind comes on with a deep seated pain in the part affected; an œdematous swelling, which retains the impression of the finger; and a fluctuation, which is at first not very distinct, but, from day to day, becomes more and more palpable, and, at length, leads the surgeon to make an opening.

If an opening be not made, when the fluctuation becomes perceptible, there is some risk of the matter insinuating itself into the cavity of the pleura, in consequence of the adhesion being in part destroyed by ulceration. M. Sabatier affirms, that the case may take this course, even when the abscess has been punctured, and while a free external opening exists; and this experienced surgeon has adduced a case in confirmation of such an occurrence. (See *Médecine Opératoire, Tom.* 2, *p.* 249.)

In the same manner, if inflammation should occur in the anterior mediastinum, and end in suppuration, the abscess may possibly burst into neither of the cavities of the chest; but, make its way outward, after having rendered the sternum carious, as happened in the example, recorded by Van Swieten. (*Comment. on Boerhaave's* 895*th Aphorism.*)

External injuries, such as the perforation of the sternum with a sword, (*Vanderviel, Obs.* 19, *Cent.* 1.) a contusion, a fracture, or a caries of this bone, may give rise to an abscess in the anterior mediastinum. Galen has recorded a memorable example, where the abscess was the consequence of a wound of the forepart of the chest. After the injury, which was in the region of the sternum, seemed to have got quite well, an abscess formed in the same situation, and being opened healed up. The part, however, soon inflamed and suppurated again. The abscess could not now be cured. A consultation was held, at which Galen attended. As the sternum was obviously carious, and the pulsation of the heart was visible, every one was afraid of undertaking the treatment of the case, since, it was conceived, that it would be necessary to open the thorax itself. Galen, however, engaged to manage the treatment, without making any such opening, and he expressed his opinion, that he should be able to effect a cure. Not finding the bone so extensively diseased, as was apprehended, he even indulged considerable hopes of success. After the removal of a portion of the bone, he saw the heart quite exposed, (as is alleged) by reason of the pericardium having been destroyed by the previous disease. After the operation, the patient experienced a speedy recovery.

J. L. Petit met with a case of an abscess in the anterior mediastinum, in consequence of a gun-shot wound in the situation of the sternum. The injury had been merely dressed with some digestive application; no dilatation, nor any particular examination of the wound had been made. The patient, after being to all appearances quite well, and joining his regiment again, was soon taken ill with irregular shiverings, and other febrile symptoms. M. Petit probed the wound, and found the bone affected. As there was a difficulty of breathing, he suspected an abscess either in the diploe, or behind the sternum, and, consequently, he proposed laying the bone bare, and applying a trepan. This operation gave vent to some sanious matter, and, as soon as the inner part of the sternum was perforated, a quantity of pus was discharged. The patient was relieved, and afterwards recovered. (See *Petit's Traité des Maladies Chirurgicales, Tom.* 1, *p.* 80.)

When, in consequence of inflammation, an abscess forms deeply in the substance of the lungs, the pus more easily makes its way into the air-cells, and tends towards the bronchia, than towards the surface of the lungs. In this case, the patient spits up purulent matter. When the opening, by which the abscess has burst internally, is large, and the pus escapes from it in considerable quantity at a time, the patient is in some danger of being suffocated. However, if the opening be not immoderately large, and the pus, which is effused, be not too copious, a recovery may ensue. Abscesses in the substance of the diaphragm, and collections of matter in the liver, may also be discharged by the pus being coughed up from the trachea, when the parts affected have become connected with the lungs by adhesions, and abscesses of the liver are situated on its convex surface. When the collection of matter in the liver occupies any other situation, the abscess frequently makes its way into the colon, and the pus is discharged with the stools. Several cases of this kind are related by authors: Sabatier has recorded two in his Médecine Opératoire; Le Dran makes mention of others; and Pemberton, in his book on the Diseases of the Abdominal Viscera, p. 36, relates the occurrence of additional instances of a similar nature.

Acute and chronic abscesses not unfrequently form in the cellular substance, between the pleura and the ribs and intercostal muscles. A swelling occurs between two of those bones; the skin does not undergo any change of colour; a fluctuation is distinguishable, and sometimes an extensive œdema is observable. Such abscesses should be opened; the motions of respiration then both promote the exit of the matter, as well as the contraction of the cavity, in which it was lodged; and the disease, if unattended with caries, generally terminates favourably.

It often happens, however, that the ribs are carious, and then the cure is more tedious and difficult. A modern writer, indeed, informs us, that, when the inside of the rib is extensively carious, or when the caries is near the junction of the bone to the spine, the fistula is incurable. (*Lassus Pathologie Chirurgicale, Tom.* 1, *p.* 128, *Edit.* 1809.) On the other hand, another surgeon of vast experience recommends us, to endeavour to separate the diseased bone, either by cutting it away, or employing the trepan. (*Pelletan's Clinique Chirurgicale, Tom.* 3, *p.* 253.) Were a part of a diseased rib to admit of being sawn away, Mr. Hey's convex saw would be a more proper instrument for the purpose, than a trepan.

An abscess of the preceding kind may be so situated, and attended with such a pulsation, as greatly to resemble an aneurism of the origin of the aorta. An interesting case of this description is detailed by M. Pelletan, Tom. 3, p. 254. I shall now proceed to the consideration of empyema strictly so called. No surgical writer, with whom I am acquainted, has treated, with more discrimination, than Mr. Samuel Sharp, of the symptoms produced by collections of matter in the chest. He remarks, that it has been almost universally taught, that, when a fluid is extravasated in the thorax, the patient can only lie on the diseased side, the weight of the incumbent fluid on the mediastinum becoming troublesome, if he places himself on the sound side. For the same reason, when there is fluid in both cavities of the thorax, the patient finds it most easy to lie on his back, or to lean forwards, in order that the fluid may neither press upon the mediastinum, nor the diaphragm. But, it is noticed by Mr. Sharp, that, however true this doctrine may prove in most instances, there are a few, in which, notwithstanding the extravasation, the patient does not complain of more inconvenience in one posture, than another, nor even of any great difficulty of breathing. (See *Le Dran's Obs.* 217, and *Marchetti*, 65.)

On this account, observes Mr. Sharp, it is sometimes less easy to determine, when the operation is requisite, than if we had so exact a criterion, as we are generally supposed to have. But, says he, though this may be wanting, there are some other circumstances, which will generally guide us with a reasonable certainty. He states, that the most infallible symptom of a large quantity of fluid in one of the cavities of the thorax, is a preternatural expansion of that side of the chest, where it lies; for, in proportion as the fluid accumulates, it will necessarily elevate the ribs on that side, and prevent them from contracting so much in expiration as the ribs on the other side. Mr. Sharp also refers to Le Dran's Observ. 211, vol. 1, in order to prove, that the pressure of the fluid on the lungs may sometimes be so great, as to make them collapse, and almost totally obstruct their function. When, therefore, says Mr. Sharp, the thorax becomes thus expanded, after a previous pulmonary disorder, and the case is attended with the symptoms of a suppuration, it is probably owing to a collection of matter. The patient, he observes, will also labour under a continual low fever, and a particular anxiety from the load of fluid.

Besides this dilatation of the cavity from an accumulation of the fluid, the patient will be sensible of an undulation, which is sometimes so evident, that a bystander can plainly hear it in certain motions of the body. Mr. Sharp adds, that this was the case with a patient of his own, on whom he performed the operation; but, the fluid in this instance, he says, was very thin, being a serous matter, rather than pus.

According to the same author, it will also frequently happen, that though the skin and intercostal muscles are not inflamed, they will become œdematous in certain parts of the thorax; or, if they are not œdematous, they will be a little thickened. These symptoms, joined with the enlargement of the thorax, and the preceding affection of the pleura, or lungs, seem unquestionably to indicate the propriety of the operation. But, observes Mr. Sharp, amongst other motives to recommend it upon such an emergency, this is one, that if the operator should mistake the case, an incision of the intercostal muscles would neither be very painful, nor dangerous. (See *Critical Enquiry into the present State of Surgery, sect. on Empyema.*)

"The difficulty of lying on the side, opposite to the collection of pus," says Le Dran, "is always accounted a sign of an empyema. This sign, indeed, is in the affirmative; but, the want of it does not prove the negative; because, when there is adhesion of the lungs to the mediastinum, the patient may lie equally on both sides." (*Le Dran's Obs. p.* 108, *Edit.* 2.) The explanation of this circumstance, offered by Le Dran, is, that, when the cyst, in which the matter is contained, is between the mediastinum and the lungs, the mediastinum gradually yields to the volume of the pus, in proportion as it is formed, and the cyst in which it is contained becomes dilated; "whence habitude becomes a second nature." Whereas, in an empyemal person, in whom the lung is not adherent to the mediastinum, and who lies on the side opposite to that, on which the collection of pus is situated, the mediastinum is on a sudden loaded with an unusual weight of fluid. (*P.* 111.)

Richerand contends, that the difficulty of breathing, which patients with extravasated fluid in the chest experience in lying upon the side, opposite that on which the disease is situated, never originates, as has been commonly taught and believed, from the fluid pressing upon the mediastinum and opposite lung. "I have, (says he) produced artificial cases of hydrothorax, by injecting water into the thorax of several dead subjects, through a wound made in the side. This experiment can only be made on subjects, in which the lungs are not adherent to the parietes of the chest. In this way, from three to four pints of water were introduced. I then cautiously opened the opposite side of the chest: the ribs and lungs being removed, the mediastinum could be distinctly seen, reaching from the vertebræ to the sternum, and supporting, without yielding, the weight of the liquid, in whatever position the body was placed.

"It is evident, then, that patients, with thoracic extravasations, lie on the diseased side, in order not to obstruct the dilatation of the sound side of the respiratory organs, one part of which is already in a state of inaction. It is for the same reason, and in order not to increase the pain by the tension of the inflamed pleura, that pleuritic patients lie on the diseased side. The same thing is observable in peripneumony; in a word, in all affections of the parietes of the chest." (*Richerand, Nosographie Chirurgicale, Tom.* 4, *p.* 168, 169, *Edit.* 2.)

It appears to me, that there may be some truth in the foregoing statement; but, the experiments are far from being conclusive, with respect to the assertion, that, in cases of empyema, hydrothorax, &c. the fluid on one side of the chest does not compress the opposite lung. In the first place, the quantity of fluid is frequently much larger, than that which Richerand injected. Secondly, although the mediastinum may not be apt to yield at once to the weight of a liquid suddenly injected into one side of the thorax; yet, it may do so by the gradual effect of disease. Thirdly, many of the phenomena of emphysema seem adverse to Richerand's inference.

Although surgeons should be aware, that patients with empyema can sometimes lie in any position, without particular aggravation of the difficulty of breathing, yet, it ought to be distinctly understood, that the generality of patients with this disease cannot place themselves on the side, opposite to that, on which the collection of pus is situated, without having their respiration very materially obstructed. Another circumstance, also, which deserves to be mentioned while we are treating of the symptoms of empyema, is, that the œdema of the integuments is sometimes not confined to the thorax, but extends to more remote parts, on the same side of the body as the collection of matter. Both the foregoing remarks are confirmed by an interesting case, which has been published by Mr. Hey, of Leeds.

Sep. 3, 1788, Mr. Hey was desired to visit John Wilkinson, who had been ill ten days of the influenza. The patient was found labouring under a fever, attended with cough, difficulty of breathing, and pain in the left side of the thorax. He was bled once; had repeated blisters applied to the chest; and took nitre and antimonials, with a smooth linctus to allay his cough. He was repeatedly relieved by these means, especially by the application of the blisters; but repeatedly relapsed. At last, he became so ill, that he breathed with the utmost difficulty, and "could not lie on the right side, without danger of immediate suffocation."

Mr. Hey found the patient in the state, just now described, on the 17th of September. "His face and especially his eyelid were a little swollen on the left side." The left side of the thorax was larger, than the right, and its integuments were œdematous. Upon pressing the intercostal muscles, they felt distended; they yielded a little to a strong pressure, but rebounded again. The abdomen, especially, at its upper part, appeared to be fuller, than in the natural state. (See *Hey's Practical Observations in Surgery, p.* 476.)

Another remarkable symptom, which is occasionally produced by collections of matter in the chest, is an alteration in the position of the heart. I have seen a patient in St. Bartholomew's hospital, who had so large a quantity of matter in the left bag of the pleura, that it completely displaced the heart, which pulsated against the inside of the chest, at a considerable distance to the right of the sternum. This man's life might probably have been saved, had paracentesis thoracis been performed in time. Some suspected an aneurism from the throbbing on the right of the sternum; and the case was not fully understood till after death, when the body was opened. A little attention to the symptoms, however, might have convinced any man of moderate understanding, that it was an empyema, and that making an opening, for the discharge of the matter, afforded the only rational chance of preserving life. There had been pain and inflammation in the chest, followed by shiverings; there was very great difficulty of breathing; the heart, which previously used to beat in the usual place, no longer did so; but, now, pulsated on the right side of the thorax.

That the heart should be displaced in this manner by any large collection of fluid in the right cavity of the thorax, one would naturally expect; but, it is an occurrence, that has not been much noticed by surgical writers. M. Larrey, however, has related a highly interesting case, in which it happened. Indeed, not only was the heart pushed considerably to the right of the sternum, but, its action was so much impeded by the derangement of its position, that the pulse in the large arteries was thereby rendered extremely feeble. In this instance, also, the diaphragm had descended so low down, as to force some of the small intestines into the cavity of the pelvis. (See *Larrey's Mémoires de Chirurgie Militaire, Tom.* 3, *p.* 447, *&c.*) Pelletan has also recorded an example, in which a collection of fluid in the left cavity of the chest displaced the heart, the pulsations of which were perceptible betwixt the third and fourth ribs, of the right side, near the sternum. (*Pelletan's Clinique Chirurgicale, Tom.* 3, *p.* 276.) The heart is sometimes thrust downwards by collections of fluid in the chest, and its pulsation is distinguishable in the epigastrium. (*Hodgson on the Diseases of Arteries and Veins, p.* 95.)

The symptoms of empyema are frequently very equivocal, and the existence of the disease is generally somewhat doubtful. Panarolius opened a man, whose left lung was destroyed, at the same time that the thorax contained a considerable quantity of pus. Although the patient had been ill for two months, he had suffered no difficulty of breathing, and had had only a slight cough. Le Dran met with a case of nearly the same kind. A patient, who had been, for three days, affected with a considerable oppression, and an acute pain on the left side of the chest, got somewhat better. He felt no material difficulty of breathing, on whatever side he lay. The only thing, which he complained of, was a sense of a fluctuation in his thorax, and a little obstruction of his respiration, when he was in a sitting posture. These symptoms did not seem sufficiently decided to justify the operation, and it was delayed. The febrile symptoms continued with cold sweats, and the patient died on the eighth day. Five pints of pus were found collected in the chest. (See *Le Dran's Observations in Surgery, p.* 109, 110, *Edit.* 2.)

As the operation of empyema, and some other particulars, relating to this subject, are treated of in another part of this Dictionary, (See *Paracentesis of the Thorax*) it will only be necessary for me here to subjoin a list of works, which may be advantageously consulted for information on empyema. *Sharp's Critical Enquiry into the Present State of Surgery, sect. on Empyema. Le Dran's Observations in Surgery. Petit's Traité des Maladies Chirurgicales, Tom.* 1, *Chap.* 3, *Des Plaies de la Poitrine. Warner's Cases in Surgery, Chap.* 6, *Edit.* 4. *Mémoire sur l'Opération du Trépan au Sternum par M. de la Martinière in Mem. de l'Acad. Royale de Chirurgie, Tom.* 12, *p.* 342, *Edit. in* 12*mo. Sabatier's Médecine Opératoire, Tom.* 2, *p.* 247, *&c. Edit.* 1. *Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 363, *Edit.* 1798. *Richerand's*

*Nosographie Chirurgicale, Tom. 4, sect. des Maladies de l'Appareil respiratoire. Levéillé, Nouvelle Doctrine Chirurgicale, Tom. 2, p. 575, &c. Hey's Practical Observations in Surgery. Lassus, Pathologie Chirurgicale, Tom. 1, p. 122, &c. Larrey, Mémoires de Chirurgie Militaire, Tom. 3, p. 442, &c. Pelletan, Clinique Chirurgicale, Tom. 3, p. 236,* &c.

ENCANTHIS. (from εν, and κανθος, the angle of the eye.)

The encanthis, at its commencement, is nothing more, says Scarpa, than a small, soft, red, and sometimes rather livid, excrescence, which grows from the caruncula lachrymalis, and, at the same time, from the neighbouring semilunar fold of the conjunctiva. The inveterate encanthis is ordinarily of a very considerable magnitude; its roots extend beyond the caruncula lachrymalis, and semilunar fold, to the membranous lining of one, or both eyelids. The patient experiences very serious inconvenience from its origin, and interposition between the commissure of the eyelids, which it necessarily keeps asunder, on the side towards the nose.

The encanthis keeps up a chronic ophthalmy, impedes the action of the eyelids, and prevents in particular the complete closure of the eye. Besides, partly by compressing, and partly by displacing the orifices of the puncta lachrymalia, it obstructs the free passage of the tears into the nose.

This excrescence, on its first appearance, (continues this eminent writer,) is commonly granulated, like a mulberry, or is of a ragged, and fringed structure. Afterwards, when it has acquired a certain size, one part of it represents a granulated tumour, while the rest appears like a smooth, whitish, or ash-coloured substance, streaked with varicose vessels, sometimes advancing as far over the conjunctiva, covering the side of the eye next to the nose, as where the cornea and sclerotica unite. In this advanced state, the encanthis constantly interests the caruncula lachrymalis, the semilunar fold, and the membranous lining of one, or both eyelids. In addition to the roots, which in such circumstances connect the excrescence with the caruncula lachrymalis, the semilunar fold, and the conjunctiva of the globe of the eye, the encanthis emits an appendage, or prominent, firm elongation, along the inside of the upper, or lower eyelid, in the direction of its edge. The middle, or body, of the encanthis divides near the cornea, as it were, like a swallow's tail, to form two appendages, or elongations, one of which extends along the inner surface of the upper eyelid by the margin of which it is covered, while the other shoots, in a direction from the internal towards the external angle, along the inside of the lower eyelid, which also conceals it beneath its edge.

The body of the encanthis, or that middle portion of the whole excrescence, which reaches, from the caruncula lachrymalis, and semilunar fold, inclusively, over the conjunctiva almost to the junction of the sclerotica with the cornea, sometimes forms a prominence, as large as a small nut, or chesnut. At other times, it is of considerable size, but depressed, and broken down, as it were, at its centre. Still, however, the body of the encanthis preserves that granulated appearance, which prevailed at first; while one, or both the appendages, on the inside of the eyelids, appear rather like a lippomatous, than a granulated substance.

On turning out the inside of the eyelids, these appendages, or elongations of the encanthis, form a prominence projecting forward. When both eyelids are equally affected, and turned inside out, the lippomatous appendages conjointly represent, as it were, a ring, the back of which rests on the globe of the eye.

Fabr. Hildanus was acquainted with this disease, which he treated with success, and named, *ficus scirrhosus ad majorem oculi canthum.* (*Cent.* 1. *Obs.* 2.)

However, in the case related by Hildanus, the encanthis seems only to have had one appendage, situated on the inner surface of the upper eyelid, below its edge.

Sometimes, as is noticed on the subject of the pterygium, the encanthis assumes a cancerous malignancy. This character is evinced by the dull red, and, as it were, leaden colour of the excrescence; by its excessive hardness, and the lancinating pains, which occur in it, and extend to the forehead, the whole eye-ball, and the temple, especially, when the tumour has been slightly touched. It is, also, evinced by the propensity of the excrescence to bleed, by the partial ulcerations on its surface, which emit a fungous substance, and a thin, and exceedingly acrid discharge. This malignant species, or rather this degenerated state of the encanthis, only admits of palliative treatment; unless, indeed, an effort be made to extirpate it entirely, together with the whole of what is contained in the orbit, and, even then, the event is very dubious.

The benign encanthis, how large soever it may be, is always curable by extirpation. Those instances, which are small, incipient, and granulated, like a mulberry, or of a fringed structure, which originate either from the caruncula lachrymalis, or the semilunar fold of the conjunctiva, or from both these parts together, and even in part from the internal commissure of the eyelids, may be raised by means of a pair of forceps, and cut off from the whole of their origin, closely to their base, with the curved scissars with convex edges. In the performance of this operation, it is unnecessary to introduce a needle and thread through this little excrescence, as some are wont to do, for the purpose of raising it, and destroying more accurately all its origins, and adhesions. The same object is fulfilled by means of forceps, without inconveniencing the patient with a puncture of this kind, and drawing a thread through the part, in order to make a noose. However, in cutting out an encanthis of this small size, care should be taken not to remove, together with that portion of the excrescence which originates from the caruncula lachrymalis, any more of this latter body, than what is absolutely necessary for the precise eradication of the disease, in order that no irremediable weeping may be occasioned.

When the little excrescence has been detached from all its roots, says Scarpa, the eye must be washed several times with cold water in order to cleanse it from the blood, and then it is to be covered with a piece of fine linen, and a retentive bandage. On the 5th, 6th, or 7th day, the inflammation arising from the operation entirely ceases, and the suppuration from the wound is accompanied with the mucous appearance already described. The little wounds are then to be touched with a piece of alum, scraped to a point like a crayon, and the vitriolic collyrium, containing the mucilage of quince seeds, is to be injected into the affected eye several times a day. If these means should not bring about the wished-for cicatrization; but, on the contrary, the small wounds situated on the caruncula, and internal commissure of the eye-lids, should become stationary, and covered with proud-flesh, the argentum nitratum ought to be applied to them. The conjunctiva, however, should be avoided as much as possible, especially, if at all wounded. When the fungous granulations have been destroyed, the cure may be perfected by the collyrium already mentioned, or rather by introducing, thrice a day, between the eye-ball and internal angle of the eye-lids, the powder of tutty, and the armenian bole. Bidloo extols very much powdered chalk, either alone, or in conjunction with burnt alum. (*Exercit. Anat. Chir. Decad.* 2.)

Excision is equally applicable to the inveterate encanthis, which is of considerable size, and broken down at its body, or which forms a prominence, as large as a nut, or chesnut, with two lippomatous appendages extending along the inner surface of one, or both eye-lids. The application of a ligature to such an excrescence ought never to be regarded as a method of cure; for, the large, inveterate encanthis never has a sufficiently narrow neck to admit of being tied. On the contrary, when the tumour is voluminous, its roots, invariably, extend to the caruncula lachrymalis, the semilunar fold, and the conjunctiva covering the eye-ball, oftentimes, nearly as far as the cornea. In this state, also, the encanthis has one, or two lippomatous appendages, which reach along the membranous lining of one, or both eye-lids. Hence, though the ligature were to produce a separation of the body of the encanthis, one, or both the lippomatous appendages would still remain to be extirpated. This second operation could only be accomplished with the knife. In this disease, there is no foundation for the fear of hemorrhage, to which the advocates for the ligature attach so much importance; for, cases are recorded of considerable, inveterate encanthes being removed, without the least untoward occurrence from loss of blood. To these, Scarpa observes, he could add a great number of his own, so that no doubt can now be entertained on this point.

Pellier relates a case, in which an encanthis was followed by a dangerous hemorrhage, though it had been cut out by an expert oculist. He enters, however, into no detail concerning the nature of the complaint, nor the way, in which the operation was performed; circumstances from which one might deduce the reason of this unusual accident. Indeed, the same author adds, "I have often performed this operation for such excrescences, and have never met with a similar occurrence." (*Recueil d'Observ. sur les Maladies de l'Œil, Part.* 2. *Obs.* 118.)

In the above-mentioned case of a large, inveterate encanthis, with only one elongation on the inside of the upper eye-lid, as soon as Fabricius Hildanus had taken hold of the body of the tumour with a hook, and drawn it towards him, he turned out the inside of the eye-lid, so that the lippomatous appendage was made to project through its whole extent. Then he dissected this production away by means of a small bistoury, and, continuing the incision, he entirely detached the body of the encanthis from the conjunctiva covering the eye-ball, from the semilunar fold, and from the caruncula lachrymalis. The operation was followed by the most complete success, and ought to serve as a model, and guide, to all surgeons, who have occasion to treat this disease.

When the encanthis is large, and inveterate, with two large lippomatous elongations, one on the inside of the upper eye-lid, and the other on that of the lower one, we are to proceed in the following manner. The patient being seated, an assistant is to turn out the inside of the upper eye-lid, so as to make one of the appendages of the encanthis project outward. By means of a small bistoury, a deep incision is next to be made into the elongation, in the direction of the margin of the eye-lid; and then having taken hold of, and drawn it forwards with a pair of forceps, we are to separate it, throughout its whole length, from the inside of the upper eye-lid, proceeding from the external, towards the internal angle of the eye, as far as the body, or middle of the encanthis. We are then to do the same to the lippomatous appendage on the inside of the lower eye-lid. Afterwards the body of the encanthis is to be elevated, if possible, with a pair of forceps; but when this instrument will not answer the purpose, a double hook must be employed. This middle portion is now to be detached, partly by the bistoury, and partly by the curved scissars from the subjacent conjunctiva, on the globe of the eye, from the semilunar fold, and from the caruncula lachrymalis; dividing the substance of this last part more, or less deeply, according to the depth and hardness of the large, inveterate encanthis. Here it is proper to state distinctly, that when we have to deal with an old, large tumour of this nature, that is deeply rooted in the caruncula lachrymalis, it is not regularly in our power to preserve a sufficient quantity of the substance of this part, to prevent the tears from dropping over the cheek, after the wound is healed.

The eye is to be repeatedly washed with cold water.

The rest of the treatment, consequent to the extirpation of a large encanthis, is almost the same as what was explained in speaking of the small incipient one. Bathing the eye very frequently in the lotion of mallows, and employing anodyne, detergent collyria, are the best local means, until the mucous appearance, preceding suppuration, has taken place on the surface of the wound. Then we may have recourse to mild astringent ointments and collyria. The mildest topical applications are generally the best, both in the first stage of suppuration, as well as afterwards, particularly, when, together with the encanthis, we have removed a considerable piece of the conjunctiva, which covered the eye-ball towards the nose, and was intimately connected with the body of the excrescence.

The following case related by Marchetti, will throw additional light on the contents of this chapter. *Curavi quemdam canonicum Polonum laborantem meliceride magnitudinis jujubæ, quæ à carunculâ anguli majoris oculi ad totam pupillam porrigebatur. A multis tentata curatio medicamentis, decoctis scilicet, collyriis, et aliis hujusmodi; omnia tamen octo mensium spatio incassùm adhibita. Cùm verò me consuluisset, ipsum tumorem evellendum censui; quod cùm reformidaret, spe tamen salutis operationem admisit, quam statim molitus sum, corpore priùs expurgato accuratissimè, ab aliis medicis. Paravi itaque hamulum, quo ipsam meliceridem perforavi, et manu apprehendi, alterâ verò forcipe eamdem cum folliculo sectione separavi tum à curunculâ, tum à tunicâ adnatâ, et ipsâ pupillâ; atque ita totum tumorem eduxi sine ullâ offensa ipsius oculi; à quibus statim applicui gossypium imbutum aquâ rosaceâ cum ovi albumine agitatâ, et portiunculâ croci, patiente tres dies hoc modo fasciâ vincto; adhibito postmodum collyrio cum aquâ rosarum, et pulvere tutiæ præparatæ; quibus spatio octo dierum omnino convaluit æger; increpante licèt meam præceptore meo ab Aquapendente audaciam; cùm tamen brevi spatio temporis id præstiterim, quod alii medici non potuerunt perficere: idque præsentibus præclarissimo Joanne Dominico Sala cum multis studiosis.* (*Obs. Med. Chir. Sylloge, obs.* 21.)

The preceding account is taken from *Scarpa sulle Malattie degli Occhi.* I know of no better work, to which I can refer the reader. They who understand German, however, may peruse Richter's remarks on the subject, in his *Anfangsgr. der Wundarzn. Band* 2, *p.* 473, *&c. Edit.* 1802. He is doubtless one of the best writers on the diseases of the eye in general.

**ENCEPHALOCELE.** (from εγκεφαλον, the brain, and κηλη, a tumour.) A hernia of the brain. (See *Hernia Cerebri.*)

**ENCYSTED TUMOURS.** (See *Tumours Encysted.*)

**ENEMA.** (from ενιημι, to inject.) A glyster.

The following are some of the most useful glysters, employed in the practice of surgery.

*Cathartic.*

℞. Decocti Hordei ℔j.
Salis Muriatici ℥j.—Misce.
℞. Decocti Avenæ ℔j.
Olei Olivæ ℥ij.
Magnesiæ vitriolatæ ℥j.—Misce.

*Anodyne.*

℞. Mucilaginis Amyli, Aquæ distillatæ sing. ℥ij. Tincturæ Opii guttas XL.—Misce.
℞. Olei Olivæ ℥iv. Tincturæ Opii guttas XL.—Misce.

The two latter glysters are particularly useful in cases in which there is great irritation about the rectum, bladder, or urethra. They have great effect in diminishing spasmodic affections of this canal and the neck of the bladder.

*Tobacco,*

Employed in cases of strangulated Hernia.

℞. Nicotianæ ʒj. Aq. ferventis ℔j. The plant is to be macerated ten minutes, and the liquor then strained for use. One half should be first injected, and soon afterwards the other, unless the glyster should operate with dangerous violence, as it sometimes does in particular constitutions.

**ENTEROCELE.** (from εντερα, the bowels, and κηλη, a tumour.) A species of hernia, in which the contents of the tumour are intestine.

**ENTERO-EPIPLOCELE.** (from εντερα, the bowels, επιπλοον, the omentum, and κηλη, a tumour.) A species of hernia, in which the contents of the swelling are composed both of intestine and omentum.

**ENTERO-HYDROCELE.** (from εντερα, the bowels, and υδροκηλη, a dropsy of the scrotum.) This must mean a common scrotal rupture, with a good deal of water in the hernial sac; or else a *congenital hernia*, (in which the bowels descend into the tunica vaginalis testis,) attended with a collection of fluid in the cavity of this membrane.

**ENTEROMPHALOS,** (from εντερα, the intestines, and ομφαλος, the navel.) A hernia at the navel, formed by a protrusion of intestine.

**ENTERORAPHE.** (from εντερα, the intestines, and ραφη, a suture.) A suture of the intestines.

**ENTEROSCHEOCELE.** (from εντερα, the intestines, and οσχεοκηλη, a hernia in the scrotum.) Such a case in which the protruded parts are intestine.

**ENTROPIUM.** (from εν and τρεπω, to turn.) An inversion of the eyelids. (See *Trichiasis.*)

**EPIGLOTTIS SHOT AWAY.** The practice of M. Larrey furnishes a curious example, in which the epiglottis of a French soldier was shot off at the battle of Alexandria, on the 21st of March, 1801. The ball entered at the angle of the jaw, crossed the throat obliquely, and came out at the opposite side of the neck. The base of the tongue was grazed, and the epiglottis shot away; the patient spit it up after the accident, and shewed it to the surgeon, who first saw him. One will be convinced of the fact by an account of the symptoms.

The patient was not in much pain; but, his voice was hoarse, feeble, and scarcely audible.

When he first attempted to swallow, he was seized with a convulsive suffocating cough, attended with vomiting. Annoyed by thirst, which the extreme heat of the weather and the irritation of the wound excited, he incessantly repeated the attempts to drink; but, always with the same result. Four days were passed in this deplorable condition. He already experienced violent complaints at his stomach; continual loss of sleep; he had a small accelerated pulse; and was beginning to look thin.

Such was the state of this wounded soldier, when M. Larrey saw him on the fifth day. After making a few enquiries about what had passed after the accident, attempting to make the patient drink, and examining the interior of the mouth, M. Larrey was convinced, that the paroxysms of suffocation, and the inability to swallow depended upon the permanent opening of the glottis, the lid of which had been shot away. The prognosis of the injury was exceedingly unfavourable, and there can be no doubt, that, if the patient had been abandoned to the resources of nature, he would have died in the course of a few days. The indications were equally difficult to fulfil: the most urgent was to appease the hunger and thirst, with which this poor soldier was afflicted. M. Larrey, very fortunately, was provided with an elastic gum tube, constructed for the œsophagus. This instrument was introduced with the usual precautions, into the pharynx, and by means of it, the patient was given some drink, which relieved him much, and afterwards some rich broth. The patient was fed in this manner for six weeks, at the end of which time, he was able, without the assistance of the tube, to swallow thick panado, and thickened rice, made into little balls. The powers of speech and deglutition in time became much more perfect; in consequence, as M. Larrey imagines, of an enlargement of the arytenoid cartilages, and an expansion of that part of the base of the tongue which lies next to the glottis, having formed a sort of substitute for the epiglottis. (See *Larrey's Mémoires de Chirurgie Militaire, Tom.* 2, *p.* 145—149.)

The foregoing case illustrates, in a convincing manner, the importance and utility of elastic-gum tubes for conveying nourishment and medicines down the œsophagus in wounds about the throat. All practitioners, and, especially, military surgeons, should be duly impressed with the necessity of having such an instrument always at hand. The patient, whose case is above recited, owed his preservation altogether to this means, without which he must have been starved to death.

**EPIPHORA.** (from επιφερω, to carry with force.) By this term is meant an accumulation of tears on the anterior part of the eye; in consequence of which, the person afflicted is not only under the necessity of frequently wiping them away, but vision is injured by the morbid refraction, which they produce in the rays of light that enter the pupil. The disease may arise from a more copious secretion of tears than the puncta lachrymalia can absorb, or, as is most common, from an obstruction in the lachrymal canal, in consequence of which the tears are prevented from passing freely from the eye into the nose. (*Ware on the Epiphora, or Watery Eye.*) (See *Fistula Lachrymalis.*)

**EPIPLOCELE.** (from επιπλοον, the omentum, and κηλη, a tumour.) A hernia, formed by a protrusion of a piece of the omentum. (See *Hernia.*)

**EPIPLOOMPHALON.** (from επιπλοον, the omentum, and ομφαλος, the navel.) An omental hernia, protruding at the navel.

**EPIPLOSCHEOCELE.** (from επιπλοον, the omentum, οσχεον, the scrotum, and κηλη, a tumour.) An epiplocele, or omental hernia in the scrotum.

**EPULIS.** (from επι, upon, and ȣλα, the gums.) A small tubercle on the gums. It is said sometimes to become cancerous. The best plan of cure is to extirpate it with a knife.

**EPULOTICS.** (from επȣλοω, to cicatrize.) Applications conducive to the healing of wounds.

**ERETHISMUS.** (from ερεθιζω, to irritate.) Any thing which causes irritation. Mr. Pearson has described a state of the constitution, produced by mercury acting on it as a poison. He calls it the *mercurial erethismus*, and mentions, that it is characterized by great depression of strength, anxiety about the præcordia, irregular action of the heart, frequent sighing, trembling, a small, quick, sometimes intermitting pulse, occasional vomiting, a pale contracted countenance, a sense of coldness; but the tongue is seldom furred, nor are the vital and natural functions much disturbed. In this state, any sudden exertion will sometimes prove fatal. Mr. Pearson advises, with a view of preventing the dangerous tendency of this affection, the immediate discontinuance of the use of mercury; and exposing the patient to a dry cool air. The incipient erethismus may often be averted by the camphor mixture with large doses of the volatile alkali, if mercury be also left off. Sarsaparilla is also beneficial, when the stomach will bear it. (*Pearson on Lues Venerea, page* 156, *&c. Edit.* 2.)

**EROSION.** (from *erodo*, to gnaw off.) This word is very often used by surgical authors in the same sense as ulceration; viz. the formation of a breach, or chasm, in the substance of parts, by the action of the absorbents.

**ERYSIPELAS.** (from ερυω, to draw, and ϖελας, adjoining.) St. Anthony's fire; so called, from its tendency to draw the neighbouring parts into the same state, or, in other words, from its propensity to spread.

Erysipelas may be defined to be an inflammatory, cutaneous, and trivially elevated swelling, attended with a redness, which disappears, and leaves a white spot for a short time after being touched with the end of the finger, and the affection is characterized by a remarkable propensity to spread with rapidity to a large extent.

In this definition, we have adopted the opinion of medical and surgical writers, who have generally agreed to arrange erysipelas in the class of inflammatory complaints. However, though the affection may have such relations to the latter disorders, as will not allow it to be considered as a positively separate species of disease, yet, if its symptoms be investigated with care, it will be found, that these relations are sufficiently remote to make erysipelas and phlegmon be regarded as two very distinct kinds of inflammation. It has been thought, that the principal difference, existing between the two affections, consisted in the situation which was peculiar to each; erysipelas commonly affecting the surface of the skin, which is very irritable, while phlegmon is situated more deeply in the substance of parts. It will presently be seen, that this explanation is not sufficient to account for the very different symptoms, which belong to the two affections.

It is observed in the Parisian Chirurgical Journal, that the history of Erysipelas becomes an important consideration, when we reflect, that the disease is extremely common, and that its treatment by many practitioners is entirely prejudiced and empirical.

The Greeks, admitting into their theories of medicine the metaphysical principles of philosophy, and the superstitious ideas of the Pythagoreans, respecting numbers, agreed in the existence of four elements, four radical qualities, four temperaments, and consequently four humours and four species of tumours, produced by stagnation, or a diseased alteration of the humours above-mentioned.

Phlegmon, according to their theory, was formed by the blood, erysipelas by the bilious, œdema by the pituitous, and scirrhus by the melancholic or atrabilious temperament. But as this theory was often contradicted by observation, they were obliged to have recourse to the supposition of a mixture of the humours, by means of which tumours of a mixed description were formed; whence, no doubt, we derive the distinction of simple or true erysipelas, (produced merely by extravasation and deposit of the bilious humour under the skin:) from the compound or spurious, which took its name from the humour at the time most prevalent; hence the names of phlegmonous, œdematous, scirrhous, erysipelas, &c.

Such is Galen's idea of this disease, and which has been repeated by almost all subsequent authors who have written on the subject of tumours. The celebrated

La Motte, who criticised this theory in different parts of his work, did not dare openly to ridicule it.

Erysipelas, in general, is an inflammatory superficial swelling, not circumscribed, accompanied with lively heat and pungent pain. The whole extent of the part affected is of a bright red colour, clear and shining. This appearance subsides on pressing the part with the finger, and returns when the pressure is taken off. These characteristic marks agree with all the different sorts of erysipelas, but are variously marked, according to the different species.

The first, and most simple, is that mentioned by Sauvages in his Nosology, and Cullen in his First Lines, under the term of Erythema, from a word employed by Hippocrates in his Aphorisms, and in his Coacæ Prænotiones et Epidemicæ, to signify all the different species of erysipelatous affections.

But this word is not in general use, nor has it by any means a determinate signification: it appeared to Desault, that the general name of *bilious erysipelas*, employed by many authors, would be more eligible.

In this kind of erysipelas, the swelling is trifling, and often imperceptible, the skin of a rose-colour, generally a little verging towards yellow. The sensation, that the patient experiences, is neither tension nor pulsation, but a painful smarting, similar to what results from the application of hot water, or from exposure to the rays of the sun.

Towards the period of the invasion of this disease, and often many days before, the appetite is lost, the mouth is bitter, the tongue moist, and covered with a yellow mucus. Nausea and sometimes bilious vomitings come on. The patient becomes weak and dejected, and is affected with wandering pains and considerable heat, without any particular dryness of the skin or violent sense of thirst. Sometimes the disease begins with fever, more or less violent, preceded by shivering and violent pain in the head.

In the *phlegmonous erysipelas*, the skin is more raised than in the preceding species, the swelling harder and deeper, and of a darker colour. There is generally a slight degree of tension of the integuments, with pungent pain, and at intervals pulsatory. On the first days of the attack of this disease, there is neither bitterness in the mouth nor nausea, the skin and tongue become dry, and are accompanied with a violent sense of thirst; the pulse is full and hard, indicating plethora.

At the expiration of a few days, particularly when the disease has been treated by bleeding and an antiphlogistic regimen, the tongue becomes foul and moist at its edges, bitterness of the mouth and nausea supervene, and the disease, in its progress, offers nothing to distinguish it from bilious erysipelas.

All the different kinds of erysipelas, says Desault, may be classed under these two heads, and we may judge from the state of the primæ viæ under what class they should be arranged. There is, however, a species of erysipelas different from the rest, that requires local treatment, though the symptoms are by no means extraordinary. The species we allude to is consequent to wounds, contusions, &c.

The danger of every species of erysipelas is proportioned to its extent, to its intensity, and to the part affected; but the most dangerous of all is that which affects the head and the adjacent parts.

Hippocrates has formed an unfavourable prognostic of the erysipelas which disappears suddenly from the surface of the body, to affect the internal parts. (*Desault's Parisian Chirurgical Journal, Vol.* 2, *p.* 24—28.)

The following is a description of erysipelas, as it sometimes appears when it attacks the head.

The attack often takes place in a sudden manner, either with or without fever; but it is also frequently preceded by shiverings, complaints about the region of the heart, and other symptoms very similar to those which indicate the approach of an intermittent fever. The heat is often accompanied with a little delirium, and almost always with drowsiness of a more or less evident kind. A swelling afterwards makes its appearance, attacking the forehead, the cheeks, the nose, or eye-lids. This swelling is elastic and smooth; but it is not distinctly circumscribed, and it gradually spreads over such parts of the face as were not at first affected. The skin of the part affected becomes of a bright red colour; occasionally having a tendency to a livid hue; in other instances having a mixture of yellow. These colours disappear when pressure is made on the part affected, but very soon reappear when such pressure is discontinued. The patient experiences a burning heat, and a disagreeable pricking in the part, rather than any acute pain: sometimes he complains of a very troublesome itching. The surface of the tumour is shining, and, as it were semi-transparent: but without hardness, tension, or any sensation of throbbing. The eye-lids are often so swollen that the patient cannot see, and the whole countenance is exceedingly disfigured. Small vesicles arise over a more or less extensive part of the erysipelatous tumour; they are filled with a transparent serous fluid, and bear a great resemblance to those which are occasioned by boiling water. When such vesicles burst, the fluid which is discharged, sometimes excoriates the neighbouring parts. Frequently, there is even a slight ulceration at the base of these vesicles, which ulceration, in the worst sort of cases, assumes a gangrenous appearance, and falls rapidly into a state of complete mortification. When the disease takes a favourable course, the fever, which till now has continued, begins to abate; the vesicles dry up; and, at the end of an interval of eight or twelve days, the cuticle peels off. The degree of danger depends materially on the delirium and other symptoms indicating an affection of the brain.

The seat of erysipelas seems to be under the cuticle, in the rete mucosum; but it is not confined to this part, as the cellular membrane is always affected even in a considerable degree. The affection of this membrane, however, is very different from what happens in phlegmonous inflammation. In a genuine case of erysipelas, healthy pus is very rarely found enclosed in a circumscribed cavity; and when there is any secretion of purulent matter, a feel is communicated, on compressing the part, almost like that which a sponge would give. In such cases, the cellular substance has suffered considerably, and the part is frequently attacked by gangrene.

It is not easy to determine the causes which give rise to this complaint. There are a great many which, together with concomitant circumstances, manifestly contribute, in numerous cases, to the production of the disorder. Such are in particular:

1. Violent passions, such as anger, acute grief, &c.
2. Exposure to the heat of the sun, or that of the fire, too long continued.
3. The impression of cold damp air.
4. The action of various vegetable, mineral, and animal poisons.
5. Wounds, contusions, fractures, &c.

There is no doubt, that erysipelas is, for the most part, intimately dependent on the state of the constitution. Persons in the habit of drunkenness, and other kinds of intemperance, and who, in a state of intoxication, meet with local injuries, often have erysipelatous inflammation in consequence of them. Other subjects, who lead more regular lives, experience, when they meet with similar injuries, healthy phlegmonous inflammation.

The opinion of Hippocrates and Galen, with respect to the origin of this disorder from a congestion of the bile, is universally known to all initiated in the profession of surgery. This old doctrine has been, in some measure, revived by Tissot, and many other believers in the humoral pathology, who attribute the cause of erysipelas to an acrid humour, commonly a bilious one, diffused through the mass of the blood. But, much as I despise the absurdity of this theory, observation obliges me to confess, that the complaint seems frequently to be connected with a wrong state of the chylopoietic viscera, and especially of the liver.

A further proof, that erysipelas is mostly dependent on constitutional causes, is that the affection most frequently happens in autumn, or in any season, when hot weather is succeeded by cold and wet.

After what has been said, the characters, which distinguish erysipelas from phlegmon, may be taken notice of.

1. The inflammatory swelling, which takes place in the former, is not so elevated as in the latter, and is never plainly circumscribed.
2. In most cases, the surface of the skin seems as if it were burnt.
3. The redness, through of a bright description, disappears on pressure.
4. The sense of throbbing, and darting pain, attendant on phlegmon, is not observable.
5. The inflamed part is free from tension, and appears as if it were affected with œdema, or rather with emphysema; only one can perceive no crepitation.

As we have already remarked, however, it must not be inferred from these differences, that erysipelas is to be considered as a disease essentially distinct from those, which are called inflammatory, as it has some characters in which it manifestly approaches them. Like phlegmonous inflammations, it may be excited by any local irritation. Like other inflammations, it may end in suppuration, though of a less perfect sort, than that in which phlegmon ends, and rarely contained in a circumscribed cavity. The pulse, in this disease, as well as in others of the same class, is frequent, hard, sometimes full; and when the patients are bled, their blood has the same appearance, and is covered with the same kind of inflammatory crust, as blood taken away in other kinds of inflammation.

It is proper, however, to notice, that practitioners are not universally agreed with respect to the nature of the pulse in erysipelas: it is, according to some, particularly Mr. Pearson, soft, frequent, and often irregular. But, if due attention be paid, this difference will be found to depend on particular circumstances. In the *phlegmonous* erysipelas, the pulse will always be fuller, than in the bilious. In the impure air of hospitals, and in all places, where the air is impregnated with carbonic acid gas, and other noxious gases, we find, that various affections decidedly inflammatory, especially those which are attendant on wounds, affect the body, and the sanguiferous system in particular, in a very different manner from what is observed when the patients are living in a more salubrious air. All inflammations assume a character more or less unfavourable, in consequence of the influence of bad air. This is particularly striking in cases of erysipelas. In such instances, living in an impure atmosphere has a singular effect in augmenting the sense of weakness and dejection, which patients always experience in a certain degree; and, in these cases, it may even go so far as to produce a total alteration of the state of the pulse. But, if attention be paid to the disease in a situation where the atmosphere is not impregnated with putrid effluvia, it will be found to put on a very different shape. The symptoms of dejection, of nervous irritation, and of cerebral disturbance, are much less conspicuous, and the state of the pulse, especially in patients who have not been previously debilitated by other diseases, bears a great resemblance to that which takes place in an inflammation of the chest.

We have also to remark, that, besides bad air, many other circumstances, which do not even belong to the nature of erysipelas, may have a share in producing an alteration of its symptoms. Thus, while inflammations of another kind, such as pleurisy and acute rheumatism, particularly affect robust persons, in whom the vital principle exists with a great deal of energy, erysipelas is prone to attack persons who are aged, or of delicate and depraved constitutions. The latter is also seen making its appearance as a symptom, in weakened parts, which have in a certain degree been deprived of their tone, as is the case with œdematous parts. It is not surprising, that, in these different cases, in which the tone of the system has already suffered, the state of the pulse, in persons affected with erysipelas, should seem different from what it is in individuals, who are more healthy and robust.

I confess, that I prefer the division of erysipelas into the *phlegmonous*, *bilious*, and *local*, from wounds, &c. as adopted by Desault. By some other writers, the disease has been distinguished into the *acute erysipelas*, the *œdematous erysipelas*, and the *malignant* or *gangrenous erysipelas*. These three species are strictly only different degrees of the same disease, or varieties produced by the particular circumstances, in which the patient is placed.

## TREATMENT OF ERYSIPELAS.

The treatment of erysipelas, as it is remarked in the Parisian Chirurgical Journal, has varied materially at the different periods of the medical art. Celsus recommended bleeding indiscriminately in every species when the strength would permit. Ætius, who founded his opinion on the authority of Galen, never employed the lancet, except in cases of manifest plethora: the bilious erysipelas he treated with purgatives. Paulus Æginetus, on the contrary, never exhibited them, but when, from some obstacle, he was prevented from ordering bleeding; a practice, which, like Galen, he recommended as a general precept. Oribasius recommends medicines proper for the evacuation of the bile. Avicenna, in adopting this last method, observes, that bleeding is rarely useful, sometimes hurtful; and, yet, at the same time, admits, that there are cases, in which it is indispensable. Actuarius has made nearly the same remarks as Avicenna, and, also, extends the use of purgatives to every species of inflammation. Guy de Chauliac, Thévenin, Munnick, Sydenham, &c. prescribe bleeding in all species of erysipelas, unless the affection is extremely slight. In this opinion they are followed by a crowd of moderns, some of whom, influenced by the inspection of the blood when it presents what they term a plethoric or inflammatory crust, order the bleeding to be repeated three or four times.

Thévenin sometimes prescribed a gentle emetic, but not till after other means had been unsuccessfully tried.

Paré has remarked, that the disease generally terminates by vomitings and bilious dejections; but in his time the emetic tartar was not in use; a medicine admirably calculated to accelerate this termination: and now, though the effects of this remedy are known, yet many practitioners are afraid of employing it. Stoll himself never prescribed it, without the patient being previously prepared.

Richter, the celebrated professor of Gottingen, and one of the most judicious German authors, recommends the exhibition of an emetic on the first attack of a bilious erysipelas. He admits, however, that there are cases, though extremely rare, which require bleeding in the first instance.

Cullen proposes cooling purgatives in addition to these means, and coincides with the method employed by Sellé, who, viewing erysipelas as a species of putrid fever, joins to evacuants the use of bark, wine, and other antiseptics.

B. Bell treats this mode of practice, and the opinion on which it is founded, as purely hypothetical. He prefers the antiphlogistic regimen and bleeding, but by no means local, as it is generally productive of ulcers difficult to cure. The ancients appeared to attribute much efficacy to bleeding and the use of purgatives, and even still more to topical applications. Some recommend the use of diaphoretics and sudorifics; whilst others, and indeed the greatest number, prescribe relaxing, refreshing, and diuretic, drinks.

Alexander of Tralles, after the doctrine of Galen, prescribed only cold water to his patients. He recommended them to breathe fresh air, and to be lightly clothed; and observes, with great judgment, that this is the plan that nature seems to point out, and supports the propriety of this method by cases peculiar to himself.

Paré also attributed some advantage to fresh air, to which he joined the use of cooling medicines, &c. Sydenham, with the same views, prescribes the use of small beer. Others recommend red wine and water. Thévenin treats obstinate erysipelatous affections by means of baths, whey, veal-broth, and cold mineral waters.

Topical applications have been for a long time in general use for the cure of erysipelas; nevertheless, Hippocrates, who speaks frequently of this disease, and who relates many cases of this description in his epidemics, says nothing to induce a suspicion, that he ever had recourse to local applications. The practice of modern physicians has differed materially; they have been diffuse in the use of liniments, fomentations, poultices, and even ointments of every description. It was soon remarked, that oils, ointments, plasters, and all fatty substances, were pernicious in the treatment of erysipelas. Galen made this remark; which, however, did not prevent the use of the emp. diapalma dissolved in oil of roses. In a case of phlegmonous erysipelas, Fabricius Hildanus has seen the use of the oil of roses, continued for some days, produce gangrene. Munnick quotes this case, and Manget reports it at length. The medicaments of a benumbing and narcotic quality, recommended by Galen, Paulus Eginetus, and many others, have also tended to produce mortification.

Resolvents and repellents have been generally recommended. Authors, however, agree, that their application is not unattended with danger: for, independently of the fatal consequences formerly much apprehended from metastasis, it was objected, that induration or gangrene of the part affected might often be occasioned by their indiscriminate use. A conviction of the truth of this remark induced Paulus Eginetus to reject astringent and spirituous applications, and Avicenna to prefer the effusion of cold water on the part to more active applications. For the same reason, oxycrate, a boasted remedy among the Greeks, was preferred to weak solutions of lead, as recommended by Thévenin, and the different infusions of elder-flowers, melilot, and other similar plants, were even in more general use.

De Haen employed a decoction of elder-flowers in whey: sometimes emollients, as warm water, marshmallow water, water of frogs spawn, &c.

Hartman attributes the most serious symptoms, and even mortification of the part itself, to this last application. Celsus used cataplasms covered with compresses, moistened with cold water. Galen rendered them resolutive by the addition of oxycrate. Paulus Eginetus recommended a poultice of barley-meal; Thévenin one made of rye boiled in lime-water; and Diembroeck one composed of bean-meal and oak-leaves reduced to a powder. But it is superfluous to dwell longer on methods which have proved inefficacious, and which have been long since abandoned.

Cullen, concurring in opinion with all accurate observers on the inutility and danger of every topical application, absolutely rejects them. He allows, however, the part affected to be sprinkled with powdered starch, (a practice of late years adopted in England,) to absorb, according to Mr. B. Bell, the acrid humour which is effused, and tends to produce ulceration.

Without doubt, chalk has been employed by some practitioners to answer the same indications. (*V. J. Munnick, Chir. lib.* i. *Manget. Bibl.*)

B. Bell perfectly coincides with Cullen, with respect to the injurious effects of local applications, yet permits a thin layer of the extract of Saturn to be applied to the part by means of a feather, when the pain is very acute.

Richter, so far from approving this practice, views the extract of Saturn in the same light as other astringents, which he observes, often produce fatal consequences. This learned professor, like Sellé, Stoll, and other skilful practitioners, makes use of no application whatever to the part. Actuarius observes, also, that local applications are useless in erysipelas, and that the inflammation will subside by the use of cathartics alone.

Besides the means, which we have pointed out, there was one mentioned by Thévenin, which, during his time, was in very general use: this was the application of blisters. He proposed them with the view of evacuating, or at least diverting, the erysipelatous humour, when they were applied at a considerable distance from the part affected.

This recalls to our recollection a case mentioned by Alix, in his Observata Chirurgica, fasc. iii. where blisters were applied to the legs of a peasant, for a wandering and obstinate erysipelas, which had successively occupied the back, the thorax, and the face. The erysipelas attacked the feet, and was immediately followed by gangrene.

Such is the abridged history of what has been written on the subject of erysipelas. The means related for the cure of the disease may perhaps appear in some degree tedious; but they are more important to recollect, than theoretical distinctions of the various species of erysipelas.

Desault may be regarded as having adopted the most judicious and successful mode of treating erysipelas. The following was the practice, which he pursued in the Hôtel Dieu.

In the *bilious* erysipelas, whatever degree of heat or fever may exist, he gives, in the first instance, a grain of emetic tartar dissolved in a considerable quantity of fluid; the symptoms generally diminish as soon as the effects of the medicine have ceased. He has seen them entirely subside, although the medicine produced no other sensible alteration, in the animal economy, than an increase in the secretions of the insensible perspiration and urine: sometimes the symptoms resisted these evacuations, and he was obliged to have recourse once or twice, or even more frequently, to the use of the emetic-drink. When the erysipelas is cured, and the bitterness in the mouth and fever have subsided, two or three purges of cassia and manna, with a grain of emetic-tartar, are exhibited: during the process of the cure, the patient is ordered to drink freely of a diluting ptisan, acidulated with oxymel: as soon as the symptoms are mitigated, the diet of the patient is allowed to be made more nourishing and generous; for, when it is too rigidly observed, the case goes on less favourably, particularly in hospitals, where the air, generally speaking, is unhealthy.

The bilious erysipelas, however considerable its extent, and whatever part it may occupy, yields in a few days, to the plan here laid down; and, in the end, Desault always succeeded in the cure; nor did he recollect an instance of its return. He invariably observed, that the cases of the patients, who had been bled previously to their admission into the hospital, were the most serious and obstinate, particularly, when the bleeding had been frequently repeated.

The same practice is not applicable to the *phlegmonous* species of erysipelas. In this kind, emetics and other evacuants augment the irritation and tension, already considerable, nor should they be had recourse to till the plethora and irritation of the patient are diminished by one or more bleedings, according to the urgency of the symptoms and the strength of the patient. The bilious erysipelas, which then appears, points out the necessity of evacuations, and the proper time for their exhibition. During the whole treatment, the patient takes nothing but a diluting drink, such as whey, or a simple decoction of dog's tooth with oxymel.

When erysipelas arose from an internal cause, Desault did not employ any topical application whatever, in either species, but left the part, as much as possible, exposed to the air.

But when either bilious or phlegmonous erysipelas is consequent to a contusion, wound, or an ulcer, regimen and internal medicines, according to Desault, are insufficient, unless topical applications are employed to abate the local irritation, and to excite suppuration. With this view, cataplasms have been employed, and their good effects, he says, have been remarked in a great variety of cases: but he deems this caution essential, viz. that the application of the poultice should not extend much below the contused surface, or the edges of the wound. If any application is permitted to lay on the rest of the erysipelatous surface, according to Desault, it should be aqueous and weak, such as the aq. veg. min. in common use, made in the proportion of ℥j. of the extract of Saturn to a pint of water. (See *Desault's Parisian Chirurg. Jour. Vol. 2.*)

For my own part, I have always been in the habit of applying Goulard's Lotion to erysipelatous cases arising from wounds, and other kinds of local irritation, and I have had every reason to think such applications as beneficial in these affections as in phlegmon.

Mr. Pearson prefers mild warm cataplasms, composed of the powders of aniseed, fennel, camomile flowers, &c. mixed with a fourth part, or an equal quantity, of bread, and a proper quantity of milk. Linseed powder, he says, may sometimes prove a convenient addition.

Such writers, as have divided erysipelas into the *acute*, *œdematous*, and *gangrenous*, adopt the following mode of practice

The first indication in the treatment of the acute erysipelas, is to lessen the inflammation by bleeding, which is to be repeated, more or less, according to symptoms. Such other means are also to be adopted, as tend to diminish the force of the circulation. In short, the antiphlogistic plan, in the full sense of the expression, is proper.

In general, it is unnecessary to repeat bleeding, in any case of erysipelas, so frequently as is done in other inflammatory cases. We ought to be guided, however, in this respect, by the state of the pulse, and other symptoms, never forgetting the patient's age, the degree of strength before the disease, and the situation of the disorder itself. *Cæteris paribus*, the patient will bear bleeding better in the country, and in an open, pure air, than in a large city, and especially in an hospital.

The circulation, in the vessels on the surface of the body, should also be promoted by diluting beverages, proper doses of nitre, the saline mixture, and, above all, by administering small doses of the antimonial powder, or tartar emetic. The belly should be kept open by glysters, and mild laxatives, and, when the patient is very much inconvenienced by the irritation and excessive heat of the part affected, small doses of opium may occasionally be given.

A gentle emetic very often has an exceedingly good effect in calming the fever, and expediting the cure of the erysipelas, especially after bleeding has been practised. But emetics are not to be continued, when they have a purgative effect.

In this complaint, as in every other one, in which the head is affected, the patient should be made to keep his head, as much as possible, in an elevated position.

In the œdematous erysipelas, perhaps, bleeding is never admissible. The loss of even a very small quantity of blood may have the most fatal consequences. One should also be exceedingly sparing of other evacuations. A determination to the skin should in particular be kept up by antimonials, and irritation and pain soothed by administering the *spiritus ætheris vitriolici compositus*, æther, camphor, opium, &c.

When the disorder seems to shift its situation to any internal part, and, particularly, to the brain, blisters should be applied between the shoulders, to the head or legs, without the least delay.

In order to prevent the complaint from terminating in mortification, the patient's strength should be supported by tonic remedies, such as wine and bark.

In cases of phlegmonous erysipelas, if the inflammation continues in an unabated form beyond the seventh, or eighth day, suppuration is to be apprehended. Here Boyer recommends the employment of emollient applications, and immediately a fluctuation is distinguishable (or even what he terms "*un empâtement purulent*") he advises the surgeon to make such incisions as may be necessary for the discharge of the matter. He also states, that the incisions should be made at several depending points. (See *Boyer's Traité des Maladies Chirurgicales, T. 2, p.* 22.) It appears from the observations of Dr. Hutchison, surgeon to the Naval Hospital at Deal, that seafaring men are very liable to phlegmonous erysipelas of the extremities, particularly, of the legs. The cause is ascribed to the irritation of the salt water, and the friction of their loose coarse trowsers. In this description of patients, the disease frequently proceeds rapidly to the gangrenous state, and the consequence is the loss of many lives and limbs. Even when the danger of mortification is avoided, abscesses often occur, which spread between the muscles and under the integuments to a surprising extent: "from the ankle to the trochanter, and over the glutæi muscles." In the first few cases, which came under the care of Dr. Hutchison, this gentleman's plan of treatment, in addition to the usual medical means, consisted of *local bleeding by means of cupping glasses*, followed by fomentations. Subsequently, however, he has adopted *the method of making several free incisions with a scalpel on the inflamed surface*, in a longitudinal direction, *through the integuments*, and *down to the muscles, as early in the disease as possible*, and *before any secretions have taken place. These incisions may be about an inch and half in length, two or three inches apart, and vary in number from six to eighteen*, according to the extent of surface the disease is found to occupy. Dr. Hutchison states, that these incisions will yield between fifteen and twenty ounces of blood, and give relief to the tense skin, at the same time that they form channels for the escape of fluid, and the prevention of bags of matter. After the operation, fomentations, or saturnine lotions are employed.

By the preceding kind of treatment Dr. Hutchison thinks the fatal termination of the disease may be rendered less frequent, and gangrenous mischief wholly prevented. He supports this assertion with observing, that he has not lost a case in the Deal Hospital for the last five years, during which the practice has been followed. (See *Medico-Chirurgical Trans. Vol.* 5, p. 278, *&c.*)

On the proposal of this new and extraordinary treatment, I shall make very little comment, because I have never seen it tried. But, I shall venture to state, that I have not much opinion of it. What? are all the principles of surgery now so changed, and is the nature of the human body and constitution so altered, that inflamed parts are to be soothed by maiming and wounding them, or to use the author's words, by making "from six to eighteen incisions" in them? I would beg leave to ask, whether from six to eighteen deep cuts down to the muscles could ever be made in an uninflamed part, without producing inflammation? It is to be remarked, however, that formerly Dr. Hutchison, before his adoption of this plan, used to apply to the part affected cupping glasses, which every surgeon knows will often of themselves irritate so much by their pressure, independently of the scarifications, as to make the sound skin inflame, and sometimes slough. We must not therefore wonder, that his early treatment of the phlegmonous erysipelas did not answer. As we have mentioned above, on the authority of Boyer and other eminent surgeons, incisions may undoubtedly become necessary in cases of erysipelas; but, not before there is matter to be discharged. When once its existence is ascertained, the employment of the knife cannot too speedily follow.

In delivering the preceding sentiments, I am actuated by the most unprejudiced feelings; and this is so strictly true, that, if Dr. Hutchison's plan be found by the profession to answer, when the common methods do not, I shall hereafter be the loudest in its praise.

With regard to the treatment of the gangrenous erysipelas, nothing more need to be said than what is contained in the article on mortification.

Consult *Desault's Parisian Chirurgical Journal, Vol. 2. Also Œuvres Chirurgicales de Desault par Bichat, Tom. 2, p.* 581, *&c. Encyclopédie Méthodique, Partie Chirurgicale, art. Erysipéle. Cullen's First Lines of the Practice of Physic, Vol.* 1. *Pearson's Principles of Surgery. Some Parts of Hunter's Treatise on the Blood, Inflammation, &c. Richerand's Nosographie Chirurgicale, Tom.* 1, *p.* 118, *&c. edit.* 2. *Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 8, *&c. edit.* 1809. *Traité des Maladies Chirurgicales par M. le Baron Boyer, Tom.* 2, *p.* 6, *et seq. Hutchison in Medico-Chirurgical Trans. Vol.* 5, *p.* 278, *&c. and in his Practical Observations in Surgery*; 1816.

**ERYTHEMA.** (from ερυθρος, red.) A redness of any part. For the erythema mercuriale, see *Mercury.*

**ESCHAR.** (from εσχαροω, to form a scab, or crust.) This term is applied to a dry crust, formed by a portion of the solids deprived of life. When any living part has been burnt by the actual, or potential, cautery, all that has been submitted to the action of this application, loses its sensibility and vital principle, becomes hard, rough on the surface, and of a black, or grey, colour, forming what is properly named an *eschar.* This, in short, is only a slough, produced by caustics, or actual fire.

**ESCHAROTICS.** (from εσχαροω, to form a crust over.) Applications, which form an eschar, or deaden the surface on which they are put. By escharotics, however, surgeons commonly understand the milder kind of caustics, such as the *hydrargyrus nitratus ruber, ærugo æris,* &c.

**EXÆRESIS.** (from εξαιρεω, to remove.) One of the divisions of surgery adopted by the old surgeons; the term implies the removal of parts.

**EXCORIATION.** (from *excorio,* to take off the skin.) A separation of the cuticle; a soreness, merely affecting the surface of the skin.

**EXCRESCENCE.** (from *excresco,* to grow from.) A tumour, growing out of, or from any part, and not included in its substance.

**EXFOLIATION.** (from *exfolio,* to cast the leaf.) The separation of a dead piece of bone from the living is termed, *exfoliation.*

One part of a bone is never separated from another by the rotting of the dead part, for that which comes away is as sound as it ever was. Exfoliation takes place soonest in bones, which have the fewest cells, and whose texture is the closest. Before any part of a bone can be thrown off, by exfoliation, it must be dead. But, even then, till the process of exfoliation begins, the bone adheres as strongly as ever, and would remain for years, before it could be separated by putrefaction alone. Bones are composed of two substances, viz. a true animal matter, and an earthy one, which are only intermixed with each other. A dead bone acts on the system, in the same manner, as any other extraneous body. It stimulates the adjacent living parts; in consequence of which, such a process is begun, as must terminate in its being thrown off. The effects of this stimulus are first, that the living adjacent bone becomes more vascular; a circumstance, which always takes place, when a part has more to do, than is just sufficient for the support of life. Secondly, that the earth of the living part, where it is in contact with the dead bone, is absorbed; hence, the bone becomes softer, and adheres by its animal matter only. Thirdly, that the living animal part is at last absorbed along the surface of contact: this part of the process commences long before the last is finished. Both of them begin first at the surface; though, in their course, they do not every where take place in an equal degree at the same time. Fourthly, in proportion to the waste, made by the last part of the process, a fungus arises from the living surface, and fills up the intermediate space, so that there is no vacuum. These different stages together constitute ulceration. When any part of a bone is once loose, it will be pushed to the surface in the same manner, as most other inanimate bodies would be, and this stage is partly mechanical, and partly a continuation of ulceration. A proof of the third stage, above-mentioned, may be derived from cases, in which people die, while exfoliation is going on. A small groove, or worm-eaten canal, can then be discovered, which becomes gradually deeper, and follows the irregularities of the living and dead surfaces. After the application of the trepan, a circular piece of bone is frequently thrown off, which is always less than the space from which it came. This, however, as Mr. Hunter observed, would never be the case, were there not a loss of substance.

It was anciently believed, that whenever a bone was denuded, the exposed surface must necessarily exfoliate, and, this being taken for granted, the old surgeons used to set about bringing on an exfoliation as quickly as possible. For this purpose, the actual cautery was usually applied to the part of the bone, which was uncovered, and, as under such treatment, a portion of the bone was of course killed, and then exfoliated, the prejudiced practitioner believed, that he had only accelerated a process, which must of necessity have followed in a slow and tedious manner.

Mr. Hunter very truly remarks, that neither caustics, nor the actual cautery, hasten exfoliation; they only produce death in a part of the bone, which is the first step towards exfoliation. If caustics ever hasten exfoliation, when the bone is already dead, it must be by producing inflammation in the adjacent living bone; this brings about a change in it, and makes it exert a power, of which it was previously incapable.

Exfoliation is not a necessary consequence of a bone being laid bare, and deprived of its periosteum. If the bone be in other respects uninjured, healthy, and enjoying a vigorous circulation of blood through its texture, granulations will be generated on the surface of such bone, which will cover and firmly adhere to it, without the smallest exfoliation being thrown off; especially, in young subjects. But, if caustic, stimulating, or drying applications be made use of, the circulation in the surface of the bone will necessarily be disturbed and destroyed, and that part of the surface, through which the circulation ceases to be carried on, will be separated, and cast off, by the process of exfoliation.

If any application to an exfoliating portion of bone be at all efficacious, it must be one, which will stop the mortification in the affected bone, and promote the absorption of those particles of bone, which form the connexion between that which is living and that which is actually dead. And as the bone dies from the same causes, as the soft parts mortify, we should at least follow the same principles in practice, which we do in the latter instance, and, though from the inferior vascularity and vital powers of the bones, we cannot expect surgery to have so much control over their affections, as over those of the soft parts, yet, every good will be obtained, which it is possible to acquire. Attention to such principles will at least teach us to avoid making the death of part of a bone more extensive, than it would be, if the cautery, caustics, and strong astringents, were not employed.

The best mode of attempting to prevent an exfoliation from occurring at all on a bone, that has been exposed by a wound, is, to cover the part again, as soon as possible, with the flesh, which has been detached. This, as we shall notice in the article *Head, Injuries of*, may generally be practised with advantage, when the scalp has been detached from the cranium, provided the flap is still connected with the rest of the integuments.

When the exposed bone cannot be covered, it should be dressed with the mildest and simplest applications, with plain lint, or lint spread with the unguentum spermatis ceti.

The dead pieces of bone, when very tedious in exfoliating, when wedged in the substance of the surrounding living bone, and when so situated as to admit of being safely sawn, or cut away, may be removed in this manner, as is described in the articles *Caries* and *Necrosis*. In such operations, Mr. Hey's saws are eminently advantageous.

In speaking of necrosis, we shall have occasion to notice the efficacy, which Mr. Crowther found blisters possess in quickening the cure of necrosis, when kept open by the savin cerate, as recommended in his work on the white swelling.

The reader may consult *Trans. of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol. 2, p. 277, &c. Weidman in his excellent book, entitled "De Necrosi Ossium," has given an account of the various opinions of several distinguished writers, concerning the way, in which a dead portion of bone is separated from the living part; and he has refuted many erroneous doctrines set up by Hippocrates, Van Swieten, B. Bell, &c. See p. 23, et seq. op. cit. See also Thomson's Lectures on Inflammation, p.* 394—398.

**EXOMPHALOS.** (from εξ, out of, and ομφαλος the navel.) A hernia, protruding at the navel.

**EXOPHTHALMIA.** (from εξ, out, and οφθαλμος, the eye.)

In the case, to which the most judicious surgical writers apply the terms, *exophthalmia, ophthalmoptosis, ptosis bulbi oculi*, the eyeball is of its natural size, and free from disease; it merely changes its situation, and partly or completely protrudes from the orbit. It is only confusing the subject to consider, as specimens of this disease, the cases, in which the globe of the eye is affected with enlargement, and on that account projects from the orbit in a preternatural degree, as happens in hydrophthalmia, staphyloma, and cancerous diseases of the eye. When the globe of the eye is pushed entirely out of the orbit, it generally lies upon the temple, or cheek, and vision is totally destroyed. There are instances, however, in which a considerable degree of sight has been recovered, notwithstanding the exophthalmia was most complete, and had lasted several years. (*Hope in Philosophical Transactions for* 1744, *Richter's Bibl.* 4 *Band, p.* 343.)

There are three descriptions of causes, which may occasion exophthalmia.

1. The first and least common is a violent concussion of the head. A man fell from a height of about fifteen or sixteen feet,

and pitched upon his head. The right eye was forced out of its socket, and hung over the cheek. The patient was deprived of his senses immediately after the accident, and became affected with coma. There was a contusion over the right parietal bone; but, no fracture. The eye spontaneously resumed its natural position, a short time after the accident, and, in the course of a month, with the assistance of low diet, and repeated bleeding, the cure was completed. (*Mém. de l'Acad. de Chirurgie, Tom.* 1, *p.* 198, 4*to.*) It has been alleged, that the eye has been forced out of the orbit in a violent fit of sneezing. But, such cases, says Richter, are very uncommon, and always imply a considerable relaxation of those parts, which serve to retain the eye in its socket, or some other predisposing causes, to which attention should be paid in the treatment. (*Richter's Anfangsgrunde der Wundarz. Band* 3, *p.* 407, *edit.* 1795.)

2. A far more frequent cause of exophthalmia is a thrust in the eye with an instrument, which is narrow enough to pass between the orbit and the eyeball, so as to push the latter out of its place.

A stick, a tobacco pipe, (*White's Cases in Surgery, p.* 131.) a foil, &c. may cause the accident. Repeated experience proves, says Richter, that in such cases, however forcibly the optic nerve and muscles of the eye may be stretched; however much the interior parts of the organ may be injured on the occasion; and, though the dislocated eye be generally deprived of the faculty of seeing, yet, when the organ is replaced as speedily as possible, it not only recovers its natural motion, but also its original power of vision. (See *Scultet. Appendix, Obs.* 69. *Covillard, Obs.* 27. *Borel, Centur.* 3, *Obs.* 64. *Rhodius, Centur.* 1, *Obs.* 84. *White's Cases, p.* 131.) But, before we reduce the eye, Richter advises us always to examine the instrument, which was pushed into the orbit; as, when it is brittle, a fragment of it is exceedingly apt to remain behind in the socket, and will require to be extracted by means of the finger, or a probe. When the weapon is pointed and hard, it sometimes pierces the bones of the orbit, and enters the brain, nose, or antrum. In the first case, which is often difficult to ascertain immediately, though after a time it is generally rendered plain enough by the symptoms induced, the consequences are mostly fatal. In the two other cases, although the danger is not pressing, yet the surgeon should be very attentive, in the event of suppuration, to procure and maintain a ready outlet for the matter.

There is generally little difficulty in replacing the eye. Frequently it returns of itself into its natural situation again, as soon as any trivial obstacles to its reduction are removed; and, in other instances, it easily admits of being put into its proper place with the hand. The indication, says Richter, is always accomplished with more facility, the sooner it is attempted. When the protrusion has existed several days, and the eye and other parts in the orbit are already inflamed, Richter recommends us to endeavour to diminish the inflammation by general antiphlogistic means, and external emollient applications, before we try to replace the eye, and afterwards attempt to effect the reduction of this organ in a gradual manner. When the optic nerve, and one or more of the muscles of the eye, are torn, no hope can be entertained, that the eyesight and motion of the organ will ever be regained. But, this degree of injury, as Richter observes, cannot always be immediately detected, because the optic nerve and muscles are concealed by the conjunctiva; and, if the nature of the case were known, still it would be advisable to replace the eyeball, and endeavour to prevent the disfigurement, which its loss would unavoidably produce. But, says Richter, it is necessary, especially if the parts behind the eyeball have suffered severely, to use such means, as will ensure a ready escape for the matter, which may possibly form. The injury of the conjunctiva, muscles, and nerve, may be so violent, adds this experienced writer, that the practitioner may find it most prudent not to reduce the part, until after suppuration has taken place. Richter thinks, that a surgeon may the more readily make up his mind to this conduct, as many cases have proved, that the eyeball, even after being dislocated from the orbit a long while, has been easily replaced. The parts, which connect the eye with the orbit, may in other cases be so torn and injured, that it may be most advisable to extirpate the organ. Richter maintains, however, that this should never be done, when there is the least chance of saving the eye. If the bones in the orbit should be fractured, the reduction must not be made until the indications, which this complication presents, have been fulfilled.

When, says Richter, the instrument, with which the eye has been pushed out of its socket, is blunt and thick, like a finger, a stick, a foil, &c. the eyeball itself always sustains a violent contusion, which brings on vehement inflammation, and lessens or destroys all hope, that, after the reduction, the eyesight will be restored. Sometimes, in these cases, an extravasation of blood in the orbit occurs, the iris is lacerated, the cornea burst, and a part of the humours of the eye discharged. Although, under such circumstances, it is scarcely to be expected, that the eyesight can be recovered, yet, it is proper to reduce the eye, because should the organ be destroyed by suppuration, or the loss of its humours, the deformity may be obviated by an artificial eye, which is not the case, when the eye has been cut away. It is also to be considered, that the mischief often seems to be worse, than it really is, and the eyesight is sometimes regained contrarily to all expectation.

After the reduction of the eye, the first care of the surgeon should be to prevent and diminish inflammation. In some cases, the inflammation is slight; while, in others, especially, when the eyeball has been severely struck, it is extremely violent. All the usual antiphlogistic means, both general and topical, are to be employed, and, of the latter, Richter says, astringents are the best, as the inflammation arises from the contusion and stretching, which the parts have suffered. The possible consequences of the inflammation, such as suppuration, opacity of the cornea, &c. are to be treated according to the rules laid down in other parts of this dictionary. (See particularly *Cornea, Opacity of; Hypopium; Ophthalmy.*) In general, the sight is restored in proportion as the inflammation is diminished. Should this not happen, after the ophthalmy has been entirely removed, the surgeon must try what effect such remedies, as stimulate the nerves, will have upon the optic nerve. An account of the most eligible medicines, for this purpose, will be found in the article *Amaurosis.*

3. The third cause of exophthalmia is a preternatural tumor in the orbit. The swelling, as it enlarges, gradually pushes the eyeball out of its socket. The tumors, which may be formed in the orbit, are of several kinds. The principal, however, are encysted swellings, which may contain either an aqueous fluid, a pappy substance, or a thick matter. Sometimes, the cellular substance in the orbit is affected with induration and swelling, so as to force the eye partly or completely out of this cavity. An abscess in the orbit has also been known to make the eyeball protrude. (*Pellier.*) Exostoses in the orbit have had the same effect. In some cases, in consequence of suppuration in the antrum, the lower part of the orbit has been raised, and the eye forced out of its place. Fungous diseases of the antrum are very liable to occasion such mischief. (See *Parisian Chirurgical Journal, Vol,* 1, *p.* 104, *&c.*) In all these examples, the eyeball is displaced from the orbit gradually, and vision is at length impeded. Instances, however, are on record, where the sight was never lost, though the eye was protruded for years. (See *Richter's Chirurg. Bibliothek.* 4 *Band,* 2, *Stuck, p.* 243. *White's Cases in Surgery, p.* 135.)

Experience proves, also, that after the reduction, the motion of the eye, and power of seeing have been regained, in cases, where the eye has been gradually pushed out of the orbit, and been displaced a considerable time, even as long as several years, during all which period vision was lost. (*Acrell; Brocklesby in Med. Obs. and Enquiries, Vol.* 4.) In order to reduce the eye into its natural position, it is necessary to remove the cause, by which its protrusion is occasioned. Suppuration and fungous tumours in the antrum must be treated according to directions laid down in the article *Antrum.* After the cure of such diseases, the antrum is often reduced to its natural dimensions, and, in this circumstance, the orbit may become so wide, that the eyeball will return into it again. Should this not happen, the extirpation of the organ will be proper. The induration and swelling of the cellular substance in the orbit may be sometimes dispersed by means of mercury, (See *Louis, sur Plusieurs Maladies du Globe de l'Œil, in Mém. de l'Acad. Royale de Chirurgie, Tom.* 13. *Edit.* 12*mo.*) When such treatment fails, we are recommended to extirpate the eye. (*Richter's Anfangsgr. der Wundarzneykunst, Band* 3, *p.* 413.) Exostoses, which are situated in the anterior part of the orbit, may sometimes be removed. The continental surgeons generally advise us to expose the tumor by an incision, and to apply caustic, or the actual cautery to it, in order to kill the protuberant part of the bone, and make it exfoliate. In this country, most practitioners would prefer the employment of cutting instruments for removing such exostoses. When, however, the tumour lies deeply in the orbit, it cannot be got at, and, if it should resist the effect of mercurial medicines and mezereon, we are directed to extirpate the eye. (*Richter, op. et loco cit.*) Abscesses in the orbit ought to be opened, and, after this has been done, the eye generally returns into its proper position. (*Pellier.*) Encysted tumours in the orbit seldom admit of being extirpated in the customary manner. Richter says, it is best to open them, press out the contained matter, and extract the cyst either immediately, or after a few days.

In a late publication, a memorable case of exophthalmia is related by Mr. Travers: the globe of the eye appears to have been gradually forced upwards and outwards, and to have had its motions considerably impeded, in consequence of the orbit being partly occupied by two swellings, which were of the nature of the aneurism by anastomosis.—(See *Aneurism.*) The swellings could not have been removed, without at the same time extirpating the eye. Mr. Travers was therefore induced to try, whether applying a ligature to the carotid artery would have the effect of checking and curing the disease; an expectation, which was warranted by analogous instances, in which the growth of swellings, and their dispersion, are brought about by lessening the quantity of blood determined to them. The experiment completely succeeded; the swellings in the vicinity of the eye subsided; the patient was freed from several grievous complaints, to which she had been previously subject; and, amongst other benefits, a cure of the exophthalmia was one result, which most interests us in the present place. The case is also highly important on other accounts, and, more particularly, as confirming the fact, that the carotid artery may be tied, without any dangerous effects on the brain, and, as proving, that, in cases of aneurism, the surgeon should not be afraid of proceeding to such an operation. (See *Medico-Chirurgical Transactions, Vol.* 2, *Art.* 1.) As I have had occasion to disagree with Mr. Travers upon one or two points in other parts of this dictionary, I feel infinite pleasure in taking this opportunity of applauding the judgment and decision, with which he acted in the case, that we have cited.

The carotid artery has also been still more recently tied by Mr. Dalrymple, surgeon at Norwich, in a case very similar to the preceding, and with equal success. (*See Medico-Chirurg. Trans. Vol.* 6, *p.* 111, *&c.*)

When the causes of exophthalmia have been removed, the eye must be put into its natural situation. If the organ has been long displaced, the surgeon often finds the fulfilment of this indication attended with difficulty. Indeed, he is frequently obliged to employ methodical bandages for the purpose of promoting the gradual return of the eye into the orbit. Yet, even in such cases, the eyesight is often regained; but, if this should not happen spontaneously, stimulants and tonics ought to be tried. (See *Amaurosis.*)

I shall conclude this article with referring to such authors, as present us with the most interesting cases and information on the preceding subject.

*Fab. Hildan. centur.* 6, *obs.* 1. *Vander Wiel, centur.* 2. *obs.* 9. *Paw, obs. anat.* 23. *Tulpius, lib.* 1, *cap.* 28. *Hope, in Philosophical Trans. for* 1744. *M. Louis sur plusieurs maladies du Globe de l'Œil, &c. in Mém. de l'Acad. de Chirurgie, Tom.* 13, *in* 12*mo. Brocklesby, in Medical Obs. and Enquiries, Vol.* 4, *p.* 371. *White's Cases in Surgery, p.* 131—135, *&c. Warner's Cases in Surgery, p.* 108. *Edit.* 4. *Lassus, Pathologie Chirurgicale, Tom.* 2, *p.* 144. *Edit.* 2. *Richerand's Nosographie Chirurgicale, Tom.* 2, *p.* 117. *Edit.* 2. *Medico-Chirurgical Transactions, Vol.* 2. *art.* 1. *Vol.* 4, *p.* 316, *and Vol.* 6. *p.* 111, *&c. Richter's Anfangsgrunde der Wundarzneykunst, Band* 3, *p.* 406, *&c. Gottingen* 1795. *The matter in this last work forms the basis of the foregoing observations.*

**EXOSTOSIS.** (from εξ, out, and οϛεον, a bone.) An exostosis is a tumor formed by the more or less considerable enlargement of a part, or of the whole, of a bone (*Boyer, Traité des Maladies Chirurgicales, T.* 3. *p.* 541.)

If bones resemble the soft parts of the body in their structure, they must resemble them in their diseases, and a swelling may take place in bones, as well as other parts. An extraordinary increase of the size and density of all the bones of an individual has been observed, which affection ought probably also to be classed with the disease, to which surgeons usually apply the term exostosis.

The generality of writers, even the most modern, have admitted many diseases among exostoses, which ought to be considered in a very distinct light; I need only instance the spina ventosa.

The bones, most frequently affected with exostosis, are those of the cranium, the lower jaw, sternum, humerus, radius, ulna, bones of the carpus, the femur, and tibia. There is, however, no bone of the body, which may not become the seat of this disease. It is not uncommon to find the bones of the cranium affected with exostosis in their whole extent. The ossa parietalia sometimes become an inch thick.

Sometimes, as Boyer remarks, the tumor is confined to a small part of the affected bone, composing a mass superadded to its surface, and of various shapes. Sometimes, it rises insensibly, having no very distinct limits, and resembling a more or less regular portion of a sphere. In some instances, its figure is styloid, and it projects in a greater or less degree. On other occasions, its base is rendered distinct by a pedicle, or contraction, which varies in breadth and length in different cases. In particular instances, the exostosis, though limited to the surface of bone, occupies the whole extent of it. Thus, the whole external surface of one of the bones of the skull has been seen covered with an exostosis, while the cerebral surface of the same bone was in the natural state. The whole circumference of the femur sometimes acquires an enormous size, at the same time, that the medullary surface of the same bone continues entirely unchanged. In other examples, on the contrary, the two surfaces and the whole thickness of the bone are deformed by an augmentation of bulk; and when this happens in a cylindrical bone, the medullary cavity is more or less reduced, or even totally obliterated. There are a few extremely uncommon cases, in which the substance of a bone acquires a great density, and an ivory hardness, without any material increase of bulk. It is also very unusual for an exostosis to occupy the whole extent and thickness of a bone; and when this happens in a cylindrical bone, the articular surfaces generally remain in their natural state.

The structure and consistence of exostoses present great differences. Sometimes, especially when the tumor is not very large, and it is situated on the surface of a cylindrical bone, one may trace with the eye the diverging of the osseous fibres, in the interspace of which, one would say, that there is deposited a new bony substance, the organization of which is less distinct. Sometimes the tumor is entirely cellular, and formed of a few broad lamina, intercepting extensive spaces, which are filled with matter different from the medulla, and of various quality. This case is denominated the *laminated exostosis.* Sometimes the enlarged portion of bone makes a sort of hollow sphere, with thick hard walls, and the cavity of which is filled with fungous granulations more or less extensive and indolent. This variety of the disease differs essentially from osteosarcoma, notwithstanding external appearances. In other instances, the tumor is perfectly solid, exceeding in consistence that of the hardest bones, and equalling that of ivory. Here, the surface is sometimes smooth, and like that of the bone in its natural state; sometimes irregular, full of little projections, and in some degree stalactical. It is very uncommon to find a large portion of an exostosis converted into a pultaceous substance; but it is not at all unfrequent to see this substance composing some part of the tumor. Lastly, it very often happens, that the same exostosis presents an assemblage of the ivory substance, and of the cellular laminated substance, the cavities of which are partly filled with a pultaceous matter, and partly with a sort of gelatinous substance.

When an exostosis is not very large, it hardly affects the surrounding soft parts; but, when it has made considerable progress, the muscles become stretched and emaciated, the cellular substance is thickened, and, its layers being adherent together, a kind of confusion is produced amongst all the adjacent parts. Exostoses not of considerable size may, however, seriously interrupt the functions of certain organs. The action of the flexor muscles of the leg has been known to be obstructed by an exostosis in the vicinity of the knee. A similar tumor arising near the symphysis pubis need not be very large to impede considerably the functions of the urethra, as experience has proved. An exostosis in the orbit has been known to displace the eye and destroy vision. Lastly, exostoses when situated near certain important organs, and of large size, may affect with different degrees of gravity the functions of these parts, as the brain, the lungs, &c. (See *Boyer's Traité des Maladies Chirurgicales, T.* 3. *p.* 541—544.)

Venereal exostoses, or nodes, are observed to arise chiefly on compact bones, and such of these, as are only superficially covered with soft parts, as for instance, the bones of the cranium, and the front surface of the tibia.

The causes of exostoses do not seem to be at all understood. Most writers impute the disease to internal causes, such as scrofula and lues venerea. That the latter affection is the cause of nodes, which are certainly a species of exostosis, no one will deny; but, that scrofula is ever concerned in producing any of the other kinds of exostosis must not be admitted, at least, before some evidence is adduced in support of the doctrine. Boyer, however, and all the surgeons of the continent adopt the opinion, that scrofula is sometimes a cause of the disease.

The ease, with which bony tumours form in some persons, is a curious and remarkable fact, and tends to render it probable, that constitutional causes have considerable influence. I remember, that Mr. Abernethy mentions, in his lectures, his having seen a boy, who came out of Cornwall, who was so excessively afflicted with an apparent predisposition to exostoses, or an exuberant deposition of bony matter, that a very trifling blow would occasion a bony swelling on any bone of his body. His ligamentum nuchæ was ossified, and prevented the motion of his neck; the margins of his axillæ were also ossified, so that he was, as it were, completely pinioned. Besides all this, the subject in question, had numerous other exostoses on various parts of his body. Mr. Abernethy gave, in this case, the muriatic and acetic acids, with a view of dissolving the lime in the lad's system, which this gentleman thought might be too abundant, and not duly carried off in proportion to its secretion. The boy was also forbidden to eat food, containing any kind of lime.

When an exostosis depends upon lues venerea, it is almost always preceded by an acute pain, which in the beginning extends to nearly the whole of the affected bone, but afterwards becomes fixed to the point, where the exostosis forms, and it is most severe in the night-time. When an exostosis is caused by scrofula, says Boyer, the pain is duller, or rather it is quite inconsiderable. It is the same with the exostosis, which succeeds a blow, or contusion, without any manifest general cause. In the latter example, the pain, immediately excited by the accident, subsides in a few days, and the swelling occurs so slowly, that no notice is taken of it till it has attained some magnitude. (*Traité des Maladies Chirurg. T.* 3. *p.* 545.)

An exostosis constantly feels hard; but its size is various, and it may be indolent, or painful. By these signs, and its firm adhesion to the bone, it may be always distinguished from other tumours. Some exostoses cannot be ascertained before death. Such was the case in which the parietal bone was found, after death, to be three times thicker, than natural. Such also was the example, related in the memoirs of the Academy at Dijon, in which a person died from an exostosis on the internal side of the os pubis, which tumour prevented the discharge of the urine, or the introduction of a catheter, by its pressure on the neck of the bladder.

Exostoses may be either *acute*, or *chronic*, in their progress. In the first case, which, according to Boyer, happens most commonly in the cellular exostosis, described by authors under the name of *laminated*, the appearance and formation of the tumour are quick; the swelling rapidly acquires a considerable size; and it is always preceded by, and accompanied with, violent, incessant, intolerable pain, which the external and internal use of opium has little effect upon, and the intensity of which is not increased by pressure. The pain is sometimes so severe, that it occasions a good deal of the symptomatic fever. The rapid growth, and great sensibility of the tumour are difficult to explain, when we consider the natural density of the bones, and the little energy of their vital properties. But, it may be easily ascertained, that the soft parts do not contribute at all to the swelling, and that they are but little concerned in the pain, which is experienced, and which is evidently produced by the morbific action and changes going on in the structure of the bone.

In other instances, says Boyer, the tumour is preceded by no pain, and, if any pain exist, it is very slight. In these cases, which are the hardest exostoses, the tumour grows slowly; and, although it sometimes attains a considerable size, its increase is attended with no particular sensibility, and no disturbance of the animal economy. (*Boyer, op. cit. T.* 3, *p.* 546.)

Our ignorance of the pathology of exostoses, particularly their causes, accounts for the imperfection of our treatment of them. With the exception of the venereal exostosis, or node, there is no species of this affection, for which, it can be said, that we have any one medicine of the least efficacy.

Boyer, and other writers on the diseases of the bones, seem to regard some exostoses, as a perfectly inorganic mass of lime, and, consequently, they entertain no idea, that the absorbent vessels can possibly take away the particles of the tumour, just as the secerning arteries have laid them down. Such writers, however, are well aware, that nodes are capable of being diminished, and this can only be effected by the action of the absorbent system.

Boyer, indeed, does acknowledge, that he has seen a venereal exostosis of the humerus, as well as a few other bony swellings, subside; but he represents the event as extremely rare; and he advances it as a principle, that the resolution of exostoses hardly ever happens, and that the greater part of the examples recorded in proof of the occurrence were nothing more than periostoses. (*P.* 547.)

When an exostosis is hard, chronic, and free from pain and alteration of the structure of the bone, it is a much more common thing for it to cease to enlarge, and remain stationary during life, without producing inconvenience, provided it be so situated as not to impede the functions of any vital organ.

But, in the cellular exostosis, the acute and rapid progress of the disease indicates a deeper and more serious alteration of the texture of the bone. A part of the tumour usually consists of a pultaceous, or gelatinous matter, and the rest, still endued with its natural organization, though altered by the disease, soon presents one or several cavities, in which there is suppuration. At the same time, the external soft parts, being excessively and rapidly distended, inflame, ulcerate, and leave exposed a more or less extensive portion of the tumour, the disease of which has in all such cases been very wrongly supposed to be caries. It is not, observes Boyer, that the part of the swelling, denuded by ulceration, is not sometimes affected with caries; but, then it exists as a complication of the original disease, and as a particularity, by no means the result of the ulceration of the soft parts, and of the exposure of the diseased bone to the contact of the air. When the soft parts are thus ulcerated, the opening contracts to a certain point, and becomes fistulous. The suppuration is always of bad quality, and in a quantity proportioned to the size of the cavity of the abscess, and the strength of the patient. The fever, which commences at an early period of the disorder, assumes a slow type, and its continuance, together with the copiousness of the ichorous discharge, the irritation, &c. may bring on the patient's dissolution.

Spherical exostoses, with an internal cavity, and hypersarcosis, are only attended with violent pain in the beginning, and when they have attained a considerable size, they become almost indolent. But, the successive formation of the fungosities, contained in their cavity, has the effect of distending its parietes, and rendering them thin, so that such exostoses are exposed to fractures and ulceration. This last effect may indeed be a consequence of the progress of the disease, and give rise to a series of consecutive symptoms, which may be compared with those, which have been described in the preceding case. The spherical exostosis, however, is less dangerous, perhaps, because the disease extends less deeply. Such tumours admit of being directly attacked, and operations for the destruction of the parietes of the cavity, and of the fungous growth, which it includes, may be successfully practised; an attempt, which would certainly be useless and dangerous in the foregoing instance.

One termination of exostosis, not spoken of by writers, but which has been observed, especially in the hard and stalactical exostosis, is that by necrosis. Tumours of this description, after acquiring a large size, have been attacked with mortification, separated from the bone, which served them as a base, and surrounded with a reproduction in every respect similar to that with which nature surrounds sequestra formed under any other circumstances. This termination is undoubtedly the most favourable of all, because nature proceeds in it slowly, without any violent disturbance; but, unfortunately, it is the least common. Art can imitate it; but her means are very inferior to those of nature. (See *Boyer's Traité des Maladies Chirurgicales, T.* 3, *p.* 547—550.)

The hardest exostosis, which has grown slowly, and without causing severe pain, is the least dangerous of all, especially, when the constitution is sound, and the patient not of a bad habit. After the disease has attained a certain size, it may become stationary, and continue in this state, without inconvenience, during life. This is most frequently observed in the *ivory* exostosis. Without having precisely this extreme hardness, however, some exostoses, which are tolerably solid, and in which the natural organization of bone is still distinguishable, are capable of undergoing a slight reduction after the removal of their cause by nature, or art. Boyer states, that this sometimes happens in a few scrofulous exostoses, and particularly in such as are venereal, and not of very large size.

The cellular exostosis is the most serious of all, especially, when the texture of the bone is considerably altered, and the disease is in a state of ulceration. The rapid formation of this species of tumour, the violent shock which it imparts to the constitution, and the hectical disturbance which it excites, generally bring the patient into imminent danger, and commonly leave no other resource, but that of amputating the limb.

The exostosis, which contains fungous growths, does not appear to be very dangerous: their base may be destroyed, and a permanent cure effected.

Lastly, the age, constitution, and strength of the patient make differences in the prognosis. (*Boyer, p.* 554.)

The treatment of exostoses is to be considered in a medical and surgical point of view. When any general cause of the disease is known, or suspected, such cause is to be removed by those means, which experience has proved to be most efficacious. Thus, Boyer recommends mercurial and antiscrofulous remedies, &c. according to the nature of the case.

Whatever may be the species of exostosis, or the nature of its cause, relief, says Boyer, may be derived from the outward use of opium, whenever the disease is attended with severe pain. He speaks favourably of the application of a linseed-meal poultice, made with a decoction of the leaves of night-shade and henbane, to which a strong solution of opium has been added. But, he thinks, that an antiphlogistic plan, with bleeding, is hardly ever admissible, because it weakens the patient too much in so tedious a disease, and can only be a palliative, incapable of curing, or preventing the ravages of the disorder.

When there is no pain, or it has been appeased, during or after any general method of treatment, which may have been indicated, the surgeon may try resolvent applications, particularly, soap and mercurial plasters, volatile liniment, bathing in water, containing a small quantity of soda, or potassa, hydro-sulphurated washes, &c. Boyer acknowledges, however, that the progress of exostoses can scarcely ever be checked by any general methodical treatment. I have already mentioned a case, in which the muriatic and acetic acids were administered; but they were not found to have any effect; nor am I acquainted with any remedies, which possess efficacy, excepting mercury, which we know is only applicable to cases of nodes. Boyer is firmly of opinion, that, with the exception of recent, small exostoses, the nature of which is even doubtful, the resolution of such tumours is almost impossible. A slight diminution of the swelling, and its becoming perfectly indolent, are the most favourable changes, which can be hoped for, whether they occur spontaneously, or are the fruit of surgical assistance. (See *Boyer's Traité des Maladies Chirurgicales, T.* 3, *p.* 554—557.)

Whether any exostoses might be lessened by keeping open a blister, over such tumours, for a considerable time, is a point, perhaps, worthy of further investigation. It is certain, that such applications tend to diminish venereal nodes, after they have been lessened as much as they can be by mercury; and we also know, that blisters, kept open, promote the absorption of the dead bone in cases of necrosis.

When exostoses merely occasion a deformity, and no pain, nor inconvenience, from the pressure, which they produce on the neighbouring parts, it is certainly most advisable not to undertake any operation for their removal; for, as Boyer has truly observed, in by far the greater number of instances, the local affection is much less to be dreaded, than the means used for removing it.

Caustics and the cautery have occasionally been applied to exostoses; but, they always do mischief. Boyer mentions an unfortunate woman, who had some caustic applied to an exostosis of the inside of the tibia; but which, instead of removing the tumour, caused a necrosis, of which she was not well two years afterwards.

When exostoses are productive of much pain and injure the health, and their situation admits of their being safely removed, with the aid of suitable saws, or even with that of a gouge and mallet; the operation may be undertaken. Many tumours of this kind, however, have bases so very extensive, and deep, that, when situated on the limbs, amputation becomes preferable to any attempt made to saw or cut away the exostoses, so as to preserve the members, on which they are situated.

In removing an exostosis, its base must be as freely exposed by the knife, as circumstances will allow, and to this part a small fine saw may be applied. It appears to me that in cutting away some exostoses, the flexible saw, described by Dr. Jeffray, of Glasgow, (see *Amputation*,) might be found useful. Mr. Hey's saws are now so well known to the profession, that I scarcely need recommend them to be remembered in the present cases.

A singular kind of exostosis, resembling a bony fungus, and growing from the antrum, is recorded by Mr. Abernethy. (See *Trans. of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol. 2, p.* 309.) The reader will find it quoted in the article, *Antrum, Diseases of.*

EXTIRPATION. (from *extirpo*, to eradicate.) The complete removal, or destruction of any part, either by cutting-instruments, the action of caustics, or the application of a ligature.

EXTRACTION. (from *extraho*, to draw out.) The taking extraneous substances out of the body. Thus bullets and splinters are said to be *extracted* from wounds; stones from the urethra, or bladder.

Surgeons also sometimes apply the term, *extraction*, to the removal of tumours out of cavities, as for instance, to the taking of cartilaginous tumours out of the joints; they seldom speak of extracting any diseased original part of the body; though, they do so in one example, viz the cataract.

EXTRACTION OF THE CATARACT. See *Cataract*.

EXTRAVASATION. (from *extra*, out of, and *vas*, a vessel.) A term, applied by surgeons to fluids, which are out of their proper vessels, or receptacles. Thus, when blood is effused on the surface, or in the ventricles of the brain, it is said, that there is an *extravasation*. See *Head, Injuries of.* When blood is poured from the vessels into the cavity of the peritoneum, in wounds of the abdomen, or when the contents of any of the intestines are effused in the same way, surgeons call this accident an *extravasation*. The urine is also said to be *extravasated*, when, in consequence of a wound, or of sloughing, or ulceration, it makes its way into the cellular substance, or among the abdominal viscera. When the bile spreads among the convolutions of the bowels, in wounds of the gall-bladder, this is a species of extravasation.

In wounds of the thorax, an extravasation of blood also frequently happens in the cavity of the pleura. Large quantities of blood are often extravasated in consequence of the vessels being ruptured by violent blows: in the scrotum, on the shoulder, and under the scalp, this effect is observed with particular frequency.

In the articles, *Head, Injuries of*, and *Thorax, Wounds of*, enough is said of extravasations of blood in the cranium, and in the cavity of the chest. Under *Wounds of the Abdomen*, much has likewise been explained relative to extravasations in this part of the body. I mentioned, however, my intention of giving in the present place a more detailed account of the valuable observations of M. Petit on this subject, and I now proceed to fulfil my promise.

Various kinds of fluids may be extravasated in the abdomen in cases of wounds, sloughing of the intestines, &c. Bile, chyle, urine, blood, feces, &c. may all possibly be effused under particular circumstances,—circumstances which are pointed out in the article, *Wounds*. Surgeons used formerly to suppose, that, whenever any fluid escaped from a vessel, or bowel, into the general cavity of the peritoneum, it always became extensively diffused amongst the convolutions of the intestines. This erroneous supposition seemed to be confirmed by facts, the most open to observation, and completely exempt from the possibility of mistake. Practitioners saw, that the water of dropsies, the pus of abscesses, which had burst into the abdomen, as well as the chyle and feces, which had escaped through a wound, or other sort of breach of an intestine, were invariably and universally diffused amongst the folds of the mesentery and bowels after death.

M. Petit (the son) first questioned the accuracy of the foregoing opinion, in relation to living subjects. He suggested, that, as in the living body, the intestines were distended with feces, alimentary matter, and air, while they were also mutually acting against each other, and in a continual state of compression from the alternate contraction of the diaphragm and abdominal muscles, there might be a superior resistance made to the weight of the extravasated fluid, which weight has a tendency to produce a separation of the viscera from each other. Is it not possible, says M. Petit, that, as soon as the patient is dead, and as soon as the above kind of resistance is destroyed, the extravasated fluid may spread without difficulty? M. Petit contends, that the truth of the preceding suggestion cannot be doubted, when we consider, that certain cases of hernia get well, notwithstanding the bursting of the gangrenous part of the intestine, after its reduction into the abdomen. In such instances, in fact, the contents of the bowel appear to escape externally through the wound entirely in consequence of the resistance made to their diffusion amongst the convolutions of the intestines. It might be objected, however, that, in cases of hernia, since the bowel is almost always adherent to the edge of the abdominal ring, the issue of the intestinal matter through the wound is rather to be ascribed to the ease, with which this event may happen, than to any resistance made internally by the surrounding viscera. But, M. Petit cites several cases, which leave no doubt, that there is a vast resistance made to the passage of extravasated fluids amongst the convolutions of the bowels, and folds of the mesentery.

After death, any fluid, extravasated in the abdomen, *may, by its mere gravity*, become dispersed among the viscera, because the parts being without action, make no opposition. But, in the living state, all the abdominal viscera reciprocally act, upon each other, and forming in consequence of this mutual support, as it were, only one body, the resistance, which is made to any extravasated matter will always keep it from becoming so widely diffused as many have imagined.

As Mr. Travers seems not to have comprehended the true sense of this part of M. Petit's essay, and has published some criticisms, which cannot be fairly applied to this valuable writer, I shall take the present opportunity of doing justice to a much respected surgeon, who cannot now stand up for himself. M. Petit writes: "Après la mort, un fluide *épanché dans le ventre, peut par son seul poids* s'insinuer à son gre et se disperser entre les différentes parties, parce qu' étant sans action, elles n'opposent aucune résistance; mais pendant la vie tous les visceres du bas-ventre agissant mutuellement les uns contre les autres, et ne faisant pour ainsi dire qu'un même corps au moyen de cette action mutuelle, la résistance qu'ils opposent au fluide épanché, ne lui permettra jamais de se disperser de la manière dont on se l'est figuré." (*Mém. de l'Acad. de Chirurgie, Tom.* 13, *p.* 169, 170.) We see, that M. Petit is here speaking of the way, in which matter, *already extravasated*, is kept from being extensively diffused in the living subject, and is endeavouring to explain, how when the compression, which all the abdominal viscera sustain during life, from the action of the muscles and other causes, is put an end to by death, *the mere gravity of the fluid, already extravasated*, may cause it to spread, and, on opening the body, the appearances may induce an erroneous idea, that the fluid was thus widely diffused, before the patient's decease.

Petit's own words, with the short comment, which I have taken the liberty to annex, will clearly shew, first, that this writer has by no means involved himself in the *glaring absurdities*, imputed to him by Mr. Travers; and, secondly, that the following remarks of this last gentleman are totally inapplicable to M. Petit.—"Granting the assumption of effusion after death, I would enquire," says Mr. Travers, "what is the nature of the *action* exerted by a dead intestine, and from what cause, or, in what degree, its *proper action* is superior to that of the surrounding parts? But, how stands the fact? *I assert, that effusion from a wounded bowel meets with the same impediment in the dead as in the living body, the resistance being purely passive.* If, therefore, effusion depends, as I am quite willing to admit, upon the action of the wounded vessel overcoming the opposed resistance, it follows, that it can never happen after death, because action has ceased, whilst resistance remains the same." (*Travers on Injuries of the Intestines, &c. p.* 15, 16.)

If Petit had alleged, that extravasation took place after death, from the action of a vessel, bowel, &c. his assertion would have been a fair mark for criticism; but, he neither says, nor means any thing of the kind: he simply explains, that matter, already extravasated before death, afterwards becomes more diffused by its own gravity, and the cessation of all active resistance to this occurrence in the dead body.

With respect to Mr. Travers's assertion, "*that effusion from a wounded bowel meets with the same impediment in the dead, as in the living body, the resistance being purely passive,*" I am sorry I cannot find reason to coincide with this unqualified declaration. By what perversion of language and common sense, can the resistance, made by the action of the diaphragm and abdominal muscles upon the viscera in a living body, be called *passive?* And would the cessation of this action, and the consequent removal of the pressure from the viscera in the living subject, were such things possible, make no difference, in regard to the facility, with which the contents of the bowels might be effused. If Mr. Travers means to ascribe the whole of the resistance to effusion to the pressure of the external air, a cause which other writers have not overlooked, (see *Wounds*) he may be more correct in the use of the term *passive;* but, his notions of the real state of things will be far too circumscribed.

I shall next follow M. Petit in the inferences, which he has drawn from the reciprocal pressure or action of the abdominal viscera upon each other.

The first consequence is, that an extravasated fluid can only spread in the cavity of the abdomen, in the same way, that a fluid becomes effused in an external part; that is to say, the extravasation can only spread gradually and successively into such places as offer the least resistance. Blood, when it insinuates itself into the interstices of the muscles, can only get from one membranous cell into another, by the first one being so distended, that the fluid can more readily get into a second cell, and, from this into a third, than increase the distended state of its first situation. Just so, in the abdomen, the blood, which escapes from a wounded vessel, is first effused into a situation near the opening in the vessel, either between the peritoneum and surface of the intestines, or, more deeply, amongst the convolutions of the bowels, or some of the folds of the mesentery. In proportion as the bleeding continues, the blood forces its original boundary, and dilates the place, which it occupied, in every direction, until it meets with less resistance in making its way, either upward, or downward, or to the right or left. The extravasation continues to dilate the new space, which it fills in the same way, until either the first limits are forced, or the effused fluid spreads in another direction. In this manner, the extravasation will spread, till the resistance, made by the viscera, becomes equal to the impetus, with which the blood issues from the vessel. M. Petit was of opinion, that it was this kind of resistance, which put a stop to the hemorrhage, even before any coagulum had been formed in the opening of the vessel. That the blood, while flowing from the vessel and in a fluid state, should only make one mass, and be contained in one cavity, till coagulation takes place, is a circumstance, which cannot rationally be imputed to any thing else, but the resistance depending upon the mutual action of the viscera in the living state. It is also equally certain, that, it is in consequence of the sudden cessation of such resistance, that extravasated blood, which is fluid after death, becomes diffused among the different convolutions of the bowels, and forms numerous scattered collections.

The second inference, which M. Petit mentions, as deducible from the resistance arising from the reciprocal pressure of the abdominal viscera, is, that an extravasation in the cavity of the abdomen cannot so easily happen, as many have fancied. It was once not an uncommon idea, that a breach in a very moderate vessel would occasion a considerable extravasation, because the orifice could not be compressed, like that of a vessel in a more external situation. It is indeed true, that no compression can be directly applied to the opening of an internal vessel; but, the resistance, which the surrounding viscera make to the extravasation, operates as a substitute. M. Petit even thought, that, when blood was effused in the abdomen, it had a greater resistance to overcome, than when extravasated in an external part. According to this author, the resistance of the cellular membrane, the common bond of connexion between the muscles, is undoubtedly less, than that, which depends upon the reciprocal action of the intestines, and rest of the viscera. The incessant alternate motion of the abdomen and thorax, is in favour of the preceding opinion. The facility, also, with which, abscesses, situated in the abdomen, are discharged, through a small, and, very frequently, not a depending opening, is an additional fact, proving, that the abdominal viscera, by the manner, in which they mutually press upon each other, make a greater resistance to an extravasation, than can be made by the cellular substance in other parts of the body.

Swords have often been thrust completely through the body, without giving rise to any very dangerous symptoms, or only to such, as frequently attend wounds, which do not reach into the cavity of the belly. We cannot imagine, contrary to all probability, that, in this case, the weapon has slipped over the viscera, through their interstices, and, by good luck, has wounded none of the blood vessels. We must rather conclude, that an extravasation does not always ensue from a wound of the bowels, or blood-vessels, or, at least, that the extravasation is not invariably attended with such consequences as former practitioners used to suppose.

For the purpose of rendering the foregoing remarks more intelligible, let us follow M. Petit in his observations, and take notice of the principle, which he has laid down in his excellent memoir; viz. that, without a particular action in the muscular fibres of the intestine, or artery, no extravasation would occur in the abdomen, even were there a breach in such bowel, or vessel. Supposing the blood-vessels destitute of action, and the place of the opening pressed upon by a force equal to that, which operates upon the rest of their extent, the fluid, which they contain, would never be effused in the abdomen, so as to form an extravasation. Besides the obvious nature of this fact, M. Petit mentions his having actually seen it exemplified in the body of a man, who died of gangrene in the abdomen, in consequence of a hernia, which had been, for upwards of a fortnight, attended with the most violent symptoms of strangulation. Nearly the whole of the intestinal canal was equally affected with gangrenous mischief, so that it was scarcely possible to handle any of the bowels, without producing a breach in them. However, although the intestines were filled with very fluid excrement, none of it was extravasated in the abdomen. In several places, indeed, Petit found numerous little breaches of continuity, which had allowed a small portion of the excrement to escape; but only just enough to tinge the adjacent parts. Petit acknowledges, at the same time, that, round where these holes were situated, some slight adhesions had taken place between the bowels, and these and other parts; but he contends, that they were so weak, and easily broken, that they must have been incapable of hindering an extravasation. Petit concludes, that, in this instance, no extravasation happened, because the intestinal canal was everywhere affected with gangrene in nearly the same degree, and the disease had destroyed the tone and action of the muscular fibres of the intestines.

It is contended by Petit, that the foregoing case affords sufficient proof, that, without a contractile power in the blood-vessels and intestines, no extravasation of their contents could be produced in the abdomen, and that such an event would be opposed by the action of the abdominal muscles and diaphragm, which make uniform and equal pressure upon all the viscera. If this statement be correct, it is obvious, first, that the greater the action of the wounded vessels is, in relation to the quantity of fluid, which they have to propel, the greater will be an extravasation from them. Secondly; that no extravasation can arise, unless the action of the vessels themselves be capable of overcoming the resistance depending upon the mutual action of the parts. Hence, only wounds of vessels above a certain size can give rise to extravasations, at least to any of importance. The veins cannot occasion so much extravasation as the arteries: nor are wounds of the intestines so liable to be followed by an effusion of the chyle and feces, as similar injuries of the blood-vessels are apt to be attended with an extravasation of blood. Petit was also of opinion, that wounds of the stomach were not, so often as those of the bowels, the cause of this kind of accident.

The feces cannot be so easily extravasated as blood, not only because the action of the intestines, particularly that of the small ones, upon their contents is weaker, than that of the arteries upon the blood, but, principally, because, when there is a breach in one of the bowels, the contents will continue their course through the intestinal canal, without any need of there being any considerable obstacle to the occurrence of an effusion. Petit admonishes us, however, not to conclude from what has been said, that the chyle and feces can never be extravasated in the abdomen. There is no doubt whatever, he observes, that an *extravasation may take place, when the wound in the bowels is of ample size, the gut filled with chyle, or excrement, and care is not taken to empty the large intestines very often by means of clysters. The event may also happen, when pain and irritation render the muscular action of the intestines violent, and when unequal pressure is made upon the abdomen.* Under such circumstances, says M. Petit, the resistance, made to an extravasation, by the reciprocal action of the viscera, is overcome, and the contents of the bowels will continue to be effused, until the impulse arising from the contraction of these organs returns to a state of equilibrium, with the resistance depending upon the mutual action of all the viscera.

The extravasation of chyle and feces, does not take place differently from that of blood; but, in wounds of the bowels, there is this advantage, that the same opening, which has given passage to the extravasated fluid, may also allow it to return and pass off. According to Petit, we need no further proof of this, than the great evacuations of blood, which some wounded persons have had with their stools, without being afflicted with any of the symptoms of an extravasation. It is highly improbable, that such bleeding could depend upon the injury of any of the vessels ramifying upon the intestinal canal, since their size is too inconsiderable. In these cases, Petit was inclined to believe, that some vessels either of the mesentery, or another part, were wounded together with the intestine, and that the blood insinuated itself into, and took its course, through the bowels, in consequence of the resistance made to its extravasation amongst the viscera.

The foregoing observations tend to prove, not only that an extravasation of intestinal matter cannot so easily happen in the abdomen as has been imagined; but, also, that it is less dangerous, than an effusion of blood usually is, and that it is accompanied with less violent symptoms. When the contents of the bowels are extravasated, adhesions are likewise observed to be more readily formed, and to limit the effused matter sooner, than when the extravasation consists of blood. After such adhesions have once been formed, Petit conceived it to be probable, that the extravasation may be dispersed in the same favourable manner, as certain abscesses, which have discharged themselves into the intestinal canal. Blood, however, can never return into the vessel, from which it has escaped, since a clot shuts up the opening. But, a wound of an intestine remains continually open, till it is closed by the adhesions, which the bowel contracts to the adjacent parts; adhesion, indeed, is the only means, by which a wound of this description can be healed.

Amongst the numerous facts, says M. Petit, which might be adduced in proof of the difficulty with which a wound of the stomach permits the aliment to be extravasated, the operation of an emetic, in such a case, is a striking one. Petit expresses his belief, that vomiting does not depend upon the action of the muscular fibres of the stomach; but, entirely upon the sudden and violent contraction of the abdominal muscles. This author conceives, that if the particular action of the stomach itself had much concern in the production of vomiting, an extravasation of the alimentary matter would necessarily happen in the abdomen, when that viscus was wounded. However, in the instances, referred to by Petit, the occurrence did not take place, because, notwithstanding the violence, with which the abdominal muscles and diaphragm contracted, they made equal and uniform pressure upon all sides of the stomach. The danger of an extravasation is also less, inasmuch as a wound of the stomach is always much smaller, in relation to its cavity, than that of a bowel, in regard to the capacity of the intestinal canal.

Circumstances are very different in respect to wounds of the gall and urinary bladders, especially, when these receptacles are full. An extravasation is then an inevitable consequence, both on account of the great fluidity of the bile, and urine, and the contractile power, with which the parts are endued, and against which, the action of the abdominal muscles makes no sort of resistance. An extravasation of these fluids is highly dangerous, by reason of their irritating quality with respect to the viscera. The colics and irregular contractions, which these stimulating fluids excite, also tend to make the extravasation become more widely diffused. The ease likewise, with which the bile and urine mix with the serum, that naturally moistens the surfaces of all the viscera, leads us to suspect, that, whenever such fluids are extravasated, they very soon become universally dispersed amongst all the convolutions of the intestines.

Against these latter extravasations, says Petit, little can be done, and, unless they are in small quantity, and their increase can be prevented, the patient's life hardly admits of being saved. Leaving a catheter in the bladder, indeed, is a sure means of hindering the extravasation of urine from increasing; but, not much confidence can be placed in the kind of outlet afforded by the duct of the gall-bladder. In the article *Gunshot-Wounds*, I shall have occasion to notice the proper treatment of wounds of the bladder, as well as the success, with which such injuries were treated by that eminent military surgeon M. Larrey.

When the extravasated matter is completely encysted and circumscribed, it happens, that, as such matter had to overcome the resistance of the parts, before it could be effused, no sooner is a passage afforded for its escape than the reaction of the separated parts necessarily forces out whatever fluid lies between them. This is a third consequence, which is pointed out by Petit, as arising from the resistance, made by the reciprocal action of the abdominal viscera to extravasations.

The foregoing remarks tend to prove, that an extravasation in the abdomen, and, especially one of blood, may be as completely discharged, as a collection of fluid in the thorax. The evacuation, at least, may always be easily effected, when the extravasation is bounded on any side by the parietes of the abdomen: a circumstance, which must invariably occur, whenever the extravasation is considerable. Indeed, Petit adds, that it was always the case, as far as his experience went, even when the effusion was not very copious. It is not enough to make surgeons understand, that fluids, extravasated in the abdomen, admit of being discharged by an operation; it is also proper to explain the symptoms, denoting the cases, in which such a proceeding should be adopted.

In order to establish the signs, whereby we may be certainly assured, that a wound, penetrating into the abdomen, has been followed by extravasation, we must begin, says Petit, by distinguishing the subsequent symptoms from those which immediately accompany the wound, and which are, properly speaking, the true symptoms, because they are essentially owing to the division of the parts affected. The first consequences of this division, are pain, irritation, tension, convulsion, strangulation, and inflammation of the abdomen, the natural sources of the other succeeding symptoms, and which vary according to the situation of the wounded parts that are inflamed, and according to the degree of inflammation. Such are the hiccough, vomiting, costiveness, the suppression or retention of the bile and urine, a violent fever, which generally happens at the beginning, and when the inflammation is arrived to a certain degree, the concentration of the pulse, which is so low as scarcely to be perceived, faintings, cold sweats. These are the effects of the primary symptoms, which we observe every day in wounds of the abdomen.

When the succours of art are seasonably applied, we not only get the better of these symptoms, and stop their progress, but often entirely prevent them. Let us suppose therefore, that by proper management, the primary symptoms have been so far remedied, that, in four, six, eight, or ten days after the wound, they are entirely dissipated, or at least much abated: if, continues Mr. Petit, after an intermission of so many days, more or less, the same symptoms return, or with greater violence, without any apparent cause, we may confidently affirm, that these secondary or subsequent symptoms are owing to an extravasation.

One can scarcely be induced to believe at first, that there should be any secondary symptoms of the extravasation of blood; for, since the extravasation commences from the very moment of the wound, why do not these symptoms commence from that instant? And why do they not increase, in proportion as the blood diffuses itself in a larger quantity?

Petit has referred the reason to the following circumstances: blood extravasated in the abdomen, does not give rise to any particular complaints, either by the pressure, which it makes, or by its quality; and, whenever any symptoms are occasioned on the first occurrence of the effusion, they are those of weakness, depending upon the loss of blood to the circulation. The extravasation afterwards becomes entirely circumscribed by the adhesions, produced by the surrounding inflammation. An additional quantity of fluid continues to be secreted from the vessels into the encysted cavity of the effused blood, and, consequently, pain, inflammation, &c. are occasioned by the increased distention now brought on. I do not, however, deem Petit's theory of this subject of much importance; perhaps, it is inaccurate; but, the fact itself, that the symptoms of an extravasation in the abdomen are consecutive, is a piece of information highly interesting to the practitioner.

The foregoing observations are only an abstract of Petit's excellent memoir, which well merits to be attentively perused by every man, who follows the profession of surgery: it is, indeed, one of the most valuable of the essays published by the French Academy of Surgery. (See *Suite de l'Essai sur les Epanchemens par feu M. Petit le fils; in Mem. de l'Acad. de Chirurgie, Tom. 4. Edit. in 12mo.*)

Much of this subject is still more particularly considered in treating of *Wounds of the Abdomen,* to which part of this dictionary the reader is referred.

**EYE, Calculus in the interior of.** Scarpa has dissected an eye, which was almost entirely transformed into a stony substance. It was taken from the body of an old woman, and was not above half as large as the other sound one. The cornea appeared dusky, and, behind it, the iris, of a very singular shape, was distinguishable, being concave, and without any pupil in its centre. The rest of the eyeball, from the limits of the cornea backward, was unusually hard to the touch.

On making an incision, Scarpa found the sclerotica and choroides almost in their natural state, and a small quantity of limpid fluid issued from the anterior chamber of the aqueous humour. Beneath the choroides, two hard calculous concave plates presented themselves, united together by means of a complete membranous substance. One was situated forward; the other backward; the latter occupied the bottom of the eye; the former the situation of the corpus ciliare and crystalline lens.

Scarpa made an incision, through the compact membrane, which joined together the margins of the two calculous bodies. He found in the cavity, instead of the vitreous humour, some drops of a glutinous bloody fluid, and, in the longitudinal direction of this cavity, a little soft cylinder, which, extending forward from the bottom of the eye, along the great axis of this organ, was inserted into a cartilaginous, elastic substance, situated in the centre of the front calculous body, precisely where, in the natural state, it is customary to find the lens, and its capsule, which were entirely wanting.

The posterior surface of the iris had formed a firm adhesion to the middle of the cartilaginous substance, situated in the centre of the front calculus. Hence, the iris, when beheld on the side next the cornea and anterior chamber appeared as it actually was, concave in the middle.

The optic nerve, which had degenerated into a mere thread, entered the sclerotica and choroides, as well as the centre, or bottom, of the posterior calculous body, and lost itself in the little soft cylinder, which, as was explained, proceeded to be inserted into the cartilaginous substance, situated in the middle of the anterior calculus, or the place naturally occupied by the lens, and its capsule. The greater part of this little cylinder, was, according to appearance, nothing else, than the membrane of the vitreous humour, destitute of fluid, shrivelled, and changed into a compact substance.

Haller met with a case similar to the foregoing one. (See *Obs. Pathol. Oper. Min. Obs.* 15.)

Fabricius Hildanus, Lancisi, as quoted by Heister, Morgagni, Morand, Zinn, and Pellier, make distinct mention of calculi in the interior of the eye. (See *Scarpa sulle Malattie degli Occhi. Venezia*, 1802.)

EYE CANCER, *and Extirpation of.* Cancer of the eye may make its attack on both sexes, and at any period of life. It seems, however, that the disease is most frequent in childhood. Experience has proved, that, at the Hôtel Dieu more than one-third of the patients, on whom Desault operated, were under twelve years of age.

It will appear probable, however, from what will be stated in describing the *Fungus Hæmatodes of the Eye*, that many of Desault's cases were this dreadful disease, and not actually carcinoma. The complaint sometimes comes on after an obstinate ophthalmy; sometimes after a blow on the eye, after wounds, a staphyloma, and, often, after fungous excrescences, which form on the surface, or in the interior of the eye. The disease is said to have been caused by the imprudent employment of topical irritating applications; very frequently the causes are of a constitutional nature.

The following symptoms commonly indicate its attack, and accompany its progress. Head-achs, and an unusual heat in the organ, are the forerunners of the disease. An uneasy itching affects the eye and adjacent parts. The organ frequently weeps a great deal, and from being from the first irritably sensible of the impression of light, it soon becomes unable to bear it without pain, unless, indeed, some previous disease should have rendered the organ incapable of transmitting the rays of light to the retina. To the itching succeeds, at the end of a certain time, a pricking sensation, which is followed by a pain, that is not very acute at first, but, afterwards, becomes extremely poignant and lancinating. The eye enlarges, and assumes not the red colour of ophthalmy, but a dull hue, ending in a livid, yellowish, or blackish one. Sight becomes obstructed and destroyed; the pains grow more acute, and the size of the organ increases, not as in hydrophthalmy, according to its natural dimensions, but, by an unequal enlargement of its surface, which becomes rough and irregular. As the magnitude of the part increases, so does the hardness. The cornea, after turning whitish, reddish, and livid, ulcerates and bursts, and fungous growths project from the opening, discharging a purulent fetid sanies.

The disease continuing, a manifest disproportion is seen between the eye and the orbit. As in hydrophthalmy, the organ projects out beyond the margin of this cavity, and forms a hideous prominence on the face. The portion of the conjunctiva, naturally reflected over the inside of each eye-lid, becomes separated in consequence of being dragged by the eye, to the front of which it applies itself, forming a reddish kind of band over it.

The suppuration puts on a more formidable aspect. The fungi increase, and become livid and dark-coloured. Hemorrhages follow, more or less frequently, and copiously. The pains, now more incessant, continually torment the patient, and, if art should not interfere, the eye-lids next swell, inflame, and become scirrhous. The lower one, over which the sanies flows, is excoriated; fungi arise from it; and the disease is propagated to the cheek, and nose, so as to present, perhaps, one of the most terrible pictures, which external disease can form. The os planum or the os ethmoides is rendered carious, as well as the os unguis; the pituitary membrane is affected; the pains increase, and become general; and the health and strength rapidly decline.

The progress of the disease does not regularly follow the above course. It varies, according as a blow, a disease, or a cancerous disposition has been the cause. It is enough to state here, however, that the patient is always brought to the grave by a terrible death, if the disease be not extirpated. As surgery possesses no means of curing this affliction, the only plan is to remove the part affected, and, practitioners, more timid in this, than other cases of cancer, never ventured to undertake the extirpation of the eye, till several ages, after they had done that of other cancerous parts.

The ancients are silent on this operation, and it is to the German surgery, that we are indebted for the first proposals of the kind. It was, for the first time, practised in the sixteenth century, with a very coarsely constructed instrument, shaped like a spoon, with cutting edges, and, by means of which, the eye was separated from the surrounding parts, and taken out of the orbit. But, this instrument, invented by Bartisch, was too large to reach to the deep contracted part of the orbit, so that either a part of the disease was left behind, or the thin delicate bones of the orbit were fractured, when the instrument was introduced too far. Fabricius Hildanus learnt these inconveniences from experience, and, to avoid them, devised a sort of probe-pointed bistoury; a better instrument, but not free from objections, and forgotten for near a century afterwards; surgeons continuing to use sometimes the above spoon, sometimes various kinds of hooks. Muys, Bartholine, &c. afford examples of operations so performed. Bidloo, more judicious, than his predecessors, made use of scissars, and a pointed bistoury. His mode of operating, though not very methodical, was crowned with several successes, a circumstance in its favour, as M. Louis has observed.

A lancet seemed to Lavauguyon sufficient for extirpating the eye, and he is the first French surgeon, who has spoken of this operation. All the surgeons of that country considered the operation, as useless, cruel, and dangerous, until St. Ives mentioned, that he had done it with success, without, however, describing the plan, which he followed. There are engraved, in the *Institut. Chir.* two tumours of the kind now under consideration, which the author removed with the bistoury, alone, which he thinks quite sufficient, and preferable to the means employed by Bartisch, Hildanus, and Muys. Several English surgeons have used a sort of curved knife, an engraving of which is given in B. Bell's system; but, in dissecting the tumour, this instrument is not so convenient, as a straight bistoury.

Thus far the plans of operating, advised by authors, were not guided by any fixed rules. M. Louis endeavoured to lay down such rules, and his method has, for a long while, been mostly adopted in France. It consists in dividing the attachments of the eye to the eye-lids; then those of the small oblique muscle; next, those of the great oblique muscle; then those of the levator palpebræ superioris, varying according to their insertions, the manner of holding the knife. The eyeball is afterwards detached, and the four straight muscles, and optic nerve, divided with a pair of scissars.

This way of operating, founded upon anatomical principles, seems at first glimpse to offer a method, in which, as M. Louis remarks, each stroke of the instrument is guided by the knowledge of the parts. But it is to be noticed, that these parts, being altered by disease, most commonly do not present the same structure and relations, which they do in the natural state; and that the flattened, lacerated, destroyed muscles, on their being confused with the eye itself, cannot serve, as in lithotomy, for the foundation of any precept relative to the operation. Besides, why use both the knife and scissars? The latter instrument is obviously useless, though M. Louis seems to think the operation cannot be done without it. The inclination of the outer side of the orbit will always allow a bistoury to be carried to the bottom of this cavity, so as to divide from above downwards, the optic nerve, and muscular attachments, which are to be drawn forward so as to render them tense.

Guided by the above principles, Desault, after having practised, and taught the method of M. Louis, returned to Heister's advice, who wishes only a bistoury to be employed. To have an exact idea of the mode of operating, which is always easy and simple with this one instrument, we must suppose the carcinoma to be in three different states. 1. When the tumour hardly projects out of the orbit, so that the eye-lids are free. 2. When it is much larger, projects considerably forward, and pushes in this direction the healthy eye-lids, which are in contact with it, together with a portion of the conjunctiva, which invests them, and is now detached from them. 3. When, in a much more advanced period, the eye-lids participate in the cancerous state. In the first case, the eye-lids must be separated from the eye, by cutting through the conjunctiva, where it turns to be reflected over the globe of the eye. In the second instance, the eye-lids and conjunctiva, which are in contact with the diseased eye, must be dissected from it. In the third, these parts must be cut away, together with the eye. (*Œuvres Chirurg. de Desault, par Bichat. Tom. 2.*)

After the above observations, it only seems necessary to annex a few brief directions for operating.

When the eye-ball is exceedingly enlarged, it is necessary to divide the eyelids at the external angle, in order to facilitate the operation. The surgeon can in general operate most conveniently when he employs a common dissecting knife, and when his patient is lying down with his face exposed to a good light. In cutting out a diseased eye, it is necessary to draw the part forwards, regularly as its surrounding attachments are divided, in order that its connexions, which are still more deeply situated, may be got at with the knife. This object cannot be very well accomplished with the fingers, or forceps, and, therefore, most surgical writers recommend us, either to introduce a ligature through the front of the tumour, or to employ a hook, for the purpose of drawing the part in any direction, during the operation, which the necessary proceedings may require. When the eye-lids are diseased, they must be removed; but, when prudence sanctions their being preserved, this is an immense advantage. The eye must not be drawn out too forcibly, before the optic nerve is divided, and care must be taken not to penetrate any of the foramina, or thin parts of the orbit, with the point of the knife, for fear of injuring the brain. Great care should also be taken to leave no diseased parts behind, in the orbit. The hemorrhage may always be securely stopped by filling the orbit with scraped lint. It is constantly advisable to remove the lachrymal gland, as this part seems to be particularly apt to be the source of such inveterate fungous diseases, as too often follow the operation.

The antiphlogistic treatment is proper, for a few days afterwards. Sometimes, fungous granulations continually form in the orbit, notwithstanding they are repeatedly destroyed, and the patient is at last exhausted. Sometimes, the disease in the orbit extends even to the brain, and produces fatal consequences. When malignant fungous excrescences grow from the cornea alone, it is clearly unnecessary to extirpate the whole eye-ball.

For information, relating to the subjects of this article, consult particularly *Mémoire sur plusieurs Maladies du Globe de l'Œil; ou l'on examine particulièrement les cas qui exigent l'extirpation de cet organe, et la Methode d'y procéder; par M. Louis, in Mém. de l' Acad. de Chirurgie, Tom.* 13, *p.* 262, *Edit. in* 12*mo. Bertrandi, Traité des Opérations de Chirurgie, p.* 519, *Edit.* 1784, *Paris. Sabatier, de la Médecine Opératoire, Tom.* 3, *p.* 54, Edit. 1. *Richter's Anfangsgrunde der Wundarzneykunst, Band,* 3, *p.* 415, *Gottingen.* 1795. *Mémoire sur l'Extirpation de l'Œil Carcinomateux in Œuvres Chirurgicales de Desault par Bichat, Tom.* 2, *p.* 102. *Richerand, Nosographie Chirurgicale, Tom.* 2, *p.* 103, *&c. Edit.* 2. *Ware, in Transactions of the Medical Society of London, Vol.* 1, *part* 1, *p.* 140, *&c. Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 450. *Edit.* 1809. *Wardrop on Fungus Hæmatodes, p.* 93, *&c.*

**EYE, DROPSY OF.** See *Hydrophthalmy.*

**EYE, INFLAMMATION OF.** See *Ophthalmy.*

For other diseases of the eye, refer to *Amaurosis; Cataract; Cornea; Encanthis; Exophthalmia; Fungus Hæmatodes; Gutta Serena; Hemeralopia; Iris, Prolapsus of; Hypopium; Leucoma; Nyctalopia; Pterygium; Pupil, Closure of; Staphyloma, &c. &c.*

# F.

**FEVERS, SURGICAL.** Under this head we comprehend two species of fever, viz. the *inflammatory,* and the *hectic,* which are particularly interesting to surgeons, because frequently attendant on surgical disorders.

We have mentioned, in treating of inflammation, that a febrile disturbance of the constitution is attendant on every considerable inflammation. In the present article, we shall endeavour to give some account of the particulars of this disorder.

The fever about to be described, is known and distinguished by several names; some calling it *inflammatory;* some *symptomatic;* and others *sympathetic.* It is sometimes idiopathic; that is to say, it occasionally originates at the same time with the local inflammation, and from the same causes. (*Burns.*) In other instances, and, indeed, we may say, in all ordinary surgical cases, it is symptomatic; or, in other words, it is produced, not directly by the causes, which originally produced the inflammation, but in consequence of the sympathy of the whole constitution for the disturbed state of a part.

The idiopathic inflammatory fever is said to be always preceded by chilliness. The symptomatic, or sympathetic inflammatory fever, sometimes takes place so quickly, in consequence of the violence of the exciting cause, or of the local inflammation, that no preceding coldness is observable. If, however, the local inflammation be more slowly induced, and, consequently, operate more gradually on the system, then the coldness is evidently perceived. The symptomatic fever, induced by scalding, or burning a part, is quickly produced, and we have very little time to attend to the period of formation. On the other hand, the symptomatic fever, induced by wounds, is excited more slowly, and the period of formation is longer. This fever is not produced, when the inflammation only affects parts in a slight degree; but, it consequently makes its appearance, if the local inflammation be considerable, or if it affect very sensible parts (*Burns.*)

The degree, in which this fever is excited, does not altogether depend upon the absolute quantity, or violence of the inflammation; but, in a great measure, upon the degree of the local inflammatory action, compared with the natural power and action of the part affected. Parts, in which the action is naturally low, are extremely painful when inflamed, and the system sympathizes greatly with them. Hence, the constitution is very much affected, when tendons, bones, or ligaments, are the parts inflamed. Severe inflammation of a large joint, every one knows, is apt to excite the most alarming, and even fatal derangement of the system. When very sensible parts are inflamed; for instance, the eye; the symptomatic fever is generally more considerable, than it would be, were it to arise from an equal quantity and degree of inflammation in a less sensible organ.

In common parts, as muscles, cellular membrane, skin, &c. the symptoms will be acute; the pulse strong and full, and the more so, if the inflammation be near the heart; but, perhaps, not so quick, as when the part is far from it. The stomach will sympathize less, and the blood will be pushed farther into the small vessels. (*Hunter.*)

If the inflammation be in tendinous, ligamentous, or bony parts, the symptoms will be less acute, the stomach will sympathize more, the pulse will not be so full, but, perhaps, quicker; there will be more irritability, and the blood will not be so much pushed into the small vessels, and, therefore, it will forsake the skin. (*Hunter.*)

It seems to be a material circumstance, whether the inflammation is in the upper, or lower extremity; that is, far from, or near to the heart, for the symptoms are more violent, the constitution more affected, and the power of resolution less, when the part inflamed is far from the source of the circulation, than when near it, even when the parts are similar, both in texture and use. (*Hunter.*)

If the heart, or lungs, are inflamed, either immediately, or affected, secondarily, by sympathy, the disease has more violent effects upon the constitution, than the same quantity of inflammation would have, if the part affected were not a vital one, or one with which the vital parts did not sympathize. If the part be such as the vital ones readily sympathize with, then the sympathetic action of the latter will affect the constitution, as in an inflammation of the testicle. (*Hunter.*) In such cases, the pulse is much quicker and smaller, and the blood is more sizy than if the inflammation were in a common part, such as muscle, cellular membrane, and skin. (*Hunter.*)

When the stomach is inflamed, the patient feels an oppression and dejection through all the stages of the inflammation; the pulse is generally low and quick, and the pain obtuse, strong, and oppressing; such as the patient can hardly bear. If the intestines are much affected, the same symptoms take place, especially if the inflammation be in the upper part of the canal; but, if only the colon be affected, the patient is more roused, and the pulse is fuller, than when the stomach only is inflamed. When the uterus is inflamed, the pulse is extremely quick and low. When the inflammation is either in the intestines, testicle, or uterus, the stomach generally sympathizes. In inflammation of the brain, the pulse varies more, than in the same affection of any other part; and, perhaps, we must, in this instance, form a judgment of the complaint, more from other symptoms, than the pulse. (*Hunter.*)

When the inflammation is situated in a part, not very essential to life, and occasions the general affection of the system, called inflammatory fever, the pulse is fuller and stronger, than common, and the blood is pushed further into the extreme arteries, than when the inflammation is in a vital part. The patient, after many occasional rigors, is at first rather roused. The pulse is, as above described, when the constitution is strong and not irritable; but, if this be extremely irritable and weak, as in many women, who lead sedentary lives, the pulse may be quick, hard, and small, at the commencement of the inflammation, just as if vital parts were concerned. The blood may also be sizy; but it will be loose and flat on the surface. (*Hunter.*)

We may set down the ordinary symptoms of the inflammatory fever, occurring in consequence of local inflammation in common parts, and in a healthy habit, as follows: The pulse is frequent, full, and strong; all the secretions are diminished; the patient is vigilant and restless; the perspiration is obstructed, and the skin is hot and dry; the urine is high-coloured, and small in quantity; the mouth is parched, and the tongue furred; there is an oppressive thirst experienced; disturbance of the nervous system; loss of appetite and sleep; and, in some cases, delirium.

### OF WHAT IS TO BE DONE FOR THE RELIEF OF THE INFLAMMATORY FEVER.

Upon this part of the subject very little is to be said; for, as the febrile disturbance of the system is produced, and entirely kept up, in almost every instance, by the local inflammation, it must be evident, that the means employed for diminishing the exciting cause, are also the best for abating the constitutional effects. Hence, it very seldom happens, that any particular measures are adopted expressly for the fever itself; as this affection is sure to subside in proportion as the local inflammation is lessened, or resolved. But, when the febrile disturbance is considerable, and the inflammation itself is also considerable, the agitated state of the system may have in its turn a share in keeping up, and even increasing, the local affection, and should be quieted as much as possible. However, in these very instances, we should, in all probability, be led to a more rigorous adoption of the antiphlogistic plan of treatment, from an abstract consideration of the state of the local inflammation itself, without any reference to that of the constitution. Indeed, the increased action of the heart and arteries, and the suppression of the secretions, require the employment of antiphlogistic means, and antimonials, the very same things, which are indicated for the resolution of the local inflammation itself. Bleeding, purging, cold drinks, low diet; the exhibition of the antimonium tartarizatum, James's powder, or the common antimonial powder; and bathing the feet and body in warm water, are measures, which have the greatest efficacy in tranquillizing the constitutional disturbance implied by the term inflammatory fever. But, I think it right to repeat, that it is hardly ever necessary to have recourse to such an evacuation as general bleeding, merely on account of the fever; as this is only an effect, which invariably subsides, in proportion as the local cause is diminished.

As Dr. Thomson has remarked, "the inflammatory fever, succeeding to external injuries, or to chirurgical operations, undergoes a kind of natural crisis by the appearance of suppuration. In these instances, therefore, unless when the patient is strong and in full health, when the disease is seated in an organ of much importance to life, or is in danger of spreading, as is the case in all inflammations of the membranes lining the three great cavities of the body, the lancet ought to be used with caution. For we may, by too free a detraction of blood, produce a sudden sinking of the powers of life, and convert the existing constitutional symptoms into fever of a different type, or character. But, in all cases of inflammation, in which any doubt arises, with regard to the farther general detraction of blood, it may, I believe, be laid down as a general rule, that it is safer to employ local, than general bloodletting." (*Thomson's Lectures on Inflammation, p.* 170.)

### HECTIC FEVER.

The sympathetic, or symptomatic fever, already described, is an *immediate* affection of the constitution, in consequence of some local disorder; the hectic fever is a *remote* one. When the hectic fever is a consequence of local disease, it has commonly been preceded by inflammation and suppuration; but, there is an inability to produce granulation and cicatrization: and the cure, of course, cannot be accomplished. The constitution may now be said to be oppressed with a local disease, or irritation, from which it cannot deliver itself.

A distinction should be made, between a hectic fever, arising entirely from a local complaint in a good constitution, which is only disturbed by too great an irritation, and a hectic fever, arising principally from the badness of the constitution; which does not dispose the parts to heal. In the first species, it is only necessary to remove the part (if removable), and then all will do well; but, in the second, nothing is gained by a removal of the part, unless the wound, made in the operation, is much less, and more easy put into a local method of cure; by reason of which, the constitution sinks less, under this state and the operation together, than under the former one. Here the nicest discrimination is requisite. (*Hunter.*)

The hectic fever comes on at very different periods after the inflammation, and commencement of suppuration, owing to a variety of circumstances. Some constitutions, having less powers of resistance, than others, must more easily fall into this state.

The hectic fever takes its rise from a variety of causes, but, which have been divided into two species, with regard to diseased parts; viz. parts called vital, and others not of this nature. Many of the causes of hectic fever, arising from diseases of the vital parts, would not produce this constitutional affection, if they were in any other part of the body; such, for instance, is the formation of tumours, either in, or so as to press upon, a vital part, or one, whose functions are immediately connected with life. Scirrhi in the stomach, and mesenteric glands; diseased lungs, liver, &c. produce hectic fever very soon.

When hectic fever arises from a disease of a part, that is not vital, it commences sooner, or later, according as it is in the power of the part to heal, or continue the disease. If the part be far from the source of the circulation, the fever will come on sooner, with the same quantity of disease. When the disease is in parts, which are not vital, and excites hectic fever, it is generally in situations, where so much mischief happens as to affect the constitution, and where the powers of healing are little. This is the case with diseases of most joints. We must also include parts, which have a tendency to such specific diseases, as are not readily cured in any situation.

Although hectic fever commonly arises from some incurable local disease of a vital part, or of an extensive disease of a common part, yet it is possible for it to be an original disease in the constitution, without any local cause whatever, that we know of.

Hectic is a slow mode of dissolution: the general symptoms are those of a low, or slow fever, attended with weakness. But, there is rather weak action, than real weakness; for, upon the removal of the hectic cause, the action of strength is immediately produced, and every natural function is re-established, however much it may be previously impaired.

The particular symptoms are debility; a small, quick, and sharp pulse; the blood forsakes the skin; loss of appetite; frequently, a rejection of all aliment from the stomach; wasting; a great readiness to be thrown into sweats; spontaneous perspirations, when the patient is in bed; the urine is pale-coloured, and very copious; and there is often a constitutional purging.

Hectic fever has been imputed to the absorption of pus into the circulation; but, this cause has been much exaggerated, as concerned in occasioning many of the bad symptoms, which frequently attack persons, who have sores. The hectic fever almost constantly attends suppuration, when in particular parts, such as vital ones. It also attends many inflammations, before actual suppuration takes place, as in cases of white swelling of the large joints. The same quantity and species of inflammation and suppuration in any of the fleshy parts, especially such as are near the source of the circulation, have in general no such effect. Hence, in the first instances, the fever is only an effect on the system, produced by a local complaint, that has a peculiar property.

The constitution sympathizes more readily with diseases of vital organs, than with those of any other parts; their diseases are also in general more difficult of cure, than the same affections of parts, which are not vital. All diseases of bones, ligaments, and tendons, affect the constitution more readily than those of muscles, skin, cellular membrane, &c.

When the disease is in vital parts, and is such as not to kill, by its first constitutional effects, the system then becomes teazed with a complaint, which is disturbing the *necessary actions of health*. In the large joints, a disease continues to harass the constitution, by attacking parts, which have no power, or rather, no disposition to produce a salutary inflammation and suppuration. Thus, the system, is also irritated by the existence of an incurable disease. Such is the theory of the cause of hectic fever.

If the absorption of matter always produced the symptoms, above described, how could any patient, who has a large sore, possibly escape becoming hectic? for, there is no reason to suppose, that one sore can absorb more readily than another. If absorbed matter occasioned such violent effects as have been commonly ascribed to it, why does not venereal matter do the same? We often know, that absorption is going on, by the progress of buboes. A large one, just on the point of bursting, has been known to be absorbed, in consequence of a few days' sea-sickness. The person continued at sea for four and twenty days afterwards; yet, no hectic symptoms followed, only the specific constitutional effects, which are of a very different description.

Matter is sometimes formed on the inside of the veins, when their cavities are inflamed, and this matter cannot fail to get into the circulation; yet, hectic symptoms do not arise. Also, very large collections of matter, which have been produced without visible inflammation, as many abscesses of the scrophulous kind, are wholly absorbed, in a very short time, but no bad symptoms are the consequence. (*Hunter.*)

Hence, we may conclude, that the absorption of pus has no share in occasioning hectic fever. Many arguments might be adduced to shew the absurdity of the doctrine; but, we can here only refer the reader to what Mr. Hunter has said further on the subject, in his work on inflammation.

It is much more probable, that the hectic fever arises from the effect, which the irritation of a vital organ, or other parts, such as joints, have on the constitution, when either incurable in themselves, or are so for a time to the constitution. (*Hunter.*)

### TREATMENT OF HECTIC FEVER.

We have no method of curing the consequences above related. All relief must depend on the cure of the cause, (viz. the local complaint) or on its removal.

Tonic medicines have been recommended, on account of the evident existence of great debility. Antiseptics have also been given, in consequence of the idea that, when pus is absorbed, it makes the blood disposed to putrify. For these reasons, bark and wine have been exhibited.

Bark will, in most cases, only assist in supporting the constitution. Until the cause is removed, however, there seems no prospect of curing a disorder of the constitution. It is true, tonic medicines may make the system less susceptible of the disease, and also contribute to diminish the cause itself, by disposing the local complaints to heal. When, however, the hectic fever arises from a specific disease, such as the venereal, though bark may enable the constitution to bear the local affection better, than it otherwise could do, yet, this medicine can never remove the syphylitic mischief. (*Hunter.*)

No medicine, not even bark itself, has any direct power of communicating strength to the human constitution. All that can be done, in the treatment of hectic fever, when it is thought inexpedient, or impracticable, to remove the morbid part, is to combat particular symptoms, and to promote digestion. It is by bringing about the latter object, that bark is useful in these cases. The infusum cinchonæ being more apt to agree with the stomach, than the decoction, or powder, should generally be preferred. Nourishing food, easy of digestion, should be frequently taken, in small quantities at a time. Nothing is more prejudicial to a weak constitution, than over-loading the stomach. Wine may also be given, but not too freely, and, not at all, if it should create heartburn, as it sometimes does in hectic patients. Madeira is less apt to have this disagreeable effect, than port. In these cases, it is likewise often found useful to administer gentle cordial aromatic draughts. But, of all medicines, opium is perhaps the most valuable to those, who are afflicted with hectic fever; it alleviates pain, procures sleep, and checks the diarrhœa, which so frequently attends such cases.

When the local complaint, connected with the fever, is totally incurable, it must, if possible, be removed by a manual operation. Thus, when a diseased joint keeps up hectic fever, and seems to present no hope of cure, amputation must be performed. But, when the local disease holds forth the chance of being cured, provided the state of the constitution were improved, the surgeon is, in this circumstance, to endeavour to support the patient's strength. Great discretion, however, must be exercised, in deciding how long it is safe to oppose the influence of an obstinate local disease over the system, by the power of medicine. Although patients, in an abject state of weakness, have oftentimes been restored to health by a removal of the morbid part, yet many have been suffered to sink so low, that no future treatment could save them from the grave. Clemency in the practice of surgery, does not consist so much in delaying strong and vigorous measures, as in boldly deciding to put them in execution, as soon as they are indicated.

When the hectic fever arises from local diseases in parts, which the constitution can bear the removal of, the morbid part should be taken away, if it cannot be cured, consistently with the advice already given. When the disease arises from some incurable disease, in an extremity, all the abovementioned symptoms cease, almost immediately after the limb has been taken off. A hectic pulse, at one hundred and twenty, has been known to sink to ninety in a few hours after the removal of the hectic cause. Persons have been known to sleep soundly the first night afterwards, who had not slept tolerably for several preceding weeks. Cold sweats have stopped immediately, as well as those, called colliquative. A purging has immediately ceased, and the urine begun to drop its sediment. (*Hunter.*)

FICATIO, or FICUS. (a fig.) A tubercle about the anus, or pudenda, resembling a fig.

FINGERS, ABSCESSES OF. See *Whitlow.*

Fingers, *Amputation of.* See *Amputation.*

Fingers, *Necrosis of.* In these cases, the surgeon is to endeavour to extract the exfoliating portions of bone, immediately they become loose. For this purpose, he is justified in making such incisions, as will enable him to fulfil the object in view. Until the process of exfoliation is sufficiently advanced, he can do little more, than apply simple dressings, and keep the part in a clean quiet state.

When the separation of the dead pieces of bone will certainly destroy the utility of the finger, and convert the part into an inconvenient, stiff appendage to the hand; or, when the patient's health is severely impaired by the irritation of the disease, the termination of which cannot be expected, within a moderate space of time; amputation is proper. It is a truth, however, that many fingers are amputated, which might be preserved, and surgeons ought to consider well, before presuming to remove parts, which, when curable, may become of the greatest consequence, in regard to the perfection of the hand. The bread of many persons, it is well known, depends on the unmutilated state of certain fingers. These remarks are offered, because I have seen several surgeons, fond of seizing every opportunity of cutting their fellow creatures, remove fingers, which might have been usefully saved, either, by allotting a little more time for the exfoliation, or by making incisions, and cutting out the dead piece of bone.

Fingers, *Dislocations of.* See *Dislocation.*

Fingers, *Fractures of.* See *Fracture.*

Fingers supernumerary. Children are occasionally born with more fingers, than are natural, and since allowing the redundant number to remain would keep up deformity, and create future inconvenience, the surgeon is called upon to amputate them. The redundant fingers are sometimes with, sometimes without a nail; are seldom more numerous than one upon each hand; are generally situated just on the outside of the little fingers; and, as far as my observation extends, are incapable of motion, in consequence of not being furnished, like the rest of the fingers, with muscles. The best plan is to cut off supernumerary fingers with a scalpel, at the place, where they are united to the other part of the hand. The operation should be performed, while the patient is in the infant state, that is to say, before the superfluous parts have acquired much size, and while the object can be accomplished with the least pain. The incisions ought to be made, so as to form a wound with edges, which will admit of being brought together with strips of adhesive plaster. As soon as the dressings are applied, the hemorrhage will almost always cease, without a ligature.

**FISSURE.** (from *findo*, to cleave asunder.) A very fine crack in a bone, has this term often applied to it. See *Fracture.*

**FISTULA**, in surgery, strictly means a sore, which has a narrow orifice, runs very deeply, is callous, and has no disposition to heal. The name is evidently taken from the similitude, which the long cavity of such an ulcer has to that of a pipe or reed. A fistula commonly leads to the situation of some disease keeping up suppuration; and from which place the matter cannot readily escape. No technical term has been more misapplied, than this; and no mis-interpretation of a word has had worse influence in practice, than that of the present one. Many simple, healthy abscesses, with small openings, have too often been called *fistulous;* and, being considered as in a callous state, the treatment pursued has in reality at last rendered them so, and been the only reason of their not having healed.

**FISTULA IN ANO.** See *Anus.*

**FISTULA LACHRYMALIS.** A disease arising from an obstruction in the ductus nasalis, and preventing the tears and mucus of the lachrymal parts of the eye from descending into the nose.

" Although the seat of this disease (says Mr. Pott) is the same in almost every subject, yet its appearance is very different in different persons, and under different circumstances. These variations depend principally on—

1. The degree of obstruction in the nasal duct.
2. The state of the cellular membrane covering the sac.
3. The state of the sacculus itself.
4. That of the bone underneath.
5. The general state and habit of the patient.*

" Sometimes a serous kind of defluxion, by which the lining of the sac and duct are so thickened as to obstruct, or prevent the passage of the fluid through them into the nose, makes the whole complaint; and the cellular membrane on the outside not being diseased, there is no appearance of inflammation. In this case the duct is stopped, and the sacculus dilated, but without any alteration in the colour of the skin; a fulness appears in the corner of the eye next to the nose; and upon the application of a finger to this tumour, a clear viscid mucus is discharged through the puncta lachrymalia; the patient feels no pain, nor finds any inconvenience, except what is produced by the discharge of this mucus, and by the trickling of the lymph down the cheek.

" In some cases the mucus is not perfectly and always clear, but is sometimes cloudy, and looks as if it had a mixture of milk or cream in it; at first waking, some of it is generally found in the corner of the eye; and the eyelashes, being smeared over with it during sleep, most commonly adhere together in the morning.

" This is the most simple state of the disease, what the French have called the hernia, or hydrops sacculi lachrymalis: it is frequently met with in children who have been rickety, or are subject to glandular obstructions; and in this state it sometimes remains for some years, subject to little alterations, as the health or habit shall happen to vary, the sacculus being sometimes more, sometimes less full, and troublesome; the mucus which is pressed out, is sometimes more, sometimes less cloudy, and now and then it is attended with a slight ophthalmy, or an inflammation of the eyelids, but which, by common care, is easily removed.

" If the sacculus is not much dilated, the discharge small, and produced only by pressure, the chief inconveniences are the weeping eye, and the gumming together of the lids, after sleeping: but these, by being attended to, may be kept from being very troublesome; and, if the disease makes no farther progress, may be so regulated as to render any more painful process totally unnecessary.

" If the dilatation is considerable, the swelling is more visible, and the quantity of mucus is larger; it is also in this state more frequently mixt and cloudy, and more troublesome, from the more frequent necessity of emptying the bag; but if the patient be adult, it may, even in this more dilated state of it, be kept from being very inconvenient.

" If an inflammation comes on, the tumour is thereby considerably increased, the discharge is larger, as well during sleep as upon pressure; the skin covering it loses its natural whiteness and softness, becomes hard, and acquires an inflamed redness; and with the mucus a mixture of something, which in colour resembles matter, is discharged, especially if the pressure be made with any force, or continued for any time: this circumstance, added to the painful sensation, and inflamed appearance of the parts, has been productive of a supposition, that in this state there is either an ulcer or an abscess within the sacculus or duct."

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* As the state and circumstances of this disease are really various, and differ very essentially from each other, the general custom of calling them all by the one name of fistula lachrymalis is absurd.

Mr. Pott next attempts to prove, that the contents of the sac are only of a mucous, not a purulent, quality.

On quitting this discussion, Mr. Pott remarks, "The inflammation of the cellular membrane covering the sac, is a circumstance which makes a considerable difference, both in the appearance of the disease, and in its requisite treatment; in some cases it is confined merely to the surface of the tumour in the corner of the eye; in others it spreads still farther, affecting the eyelids, cheek, and side of the nose.

"When the parts are in this state, the mucus within the bag has generally the appearance of being matter, that is, it wears a deep yellow colour, and is of a more thin consistence; if the puncta lachrymalia are naturally large and open, and the inflammation confined to the surface of the sac, its contents will pass off pretty freely, and the skin will remain entire; this is what the ancients called the simple, or imperfect, anchylops.

"But when the skin covering the lachrymal bag has been for some time inflamed, or subject to frequently returning inflammations, it most commonly happens, that the puncta lachrymalia are affected by it, and the fluid not having an opportunity of passing off through them, distends the inflamed skin, so that at last it becomes sloughy, and bursts externally. This is that state of the disease which is called perfect aigylops, or ægylops; the discharge which used to be made through the puncta lachrymalia, while the skin was entire, is now made through the new opening; and, by excoriating the eyelids and cheek, increases the inflammation, and gives the disease a much more disagreeable appearance. In some, the matter bursts through a small hole, and after it has discharged itself, the tumour subsides, the neighbouring parts become cool, and though the skin covering the surface of the sacculus is sloughy and foul, yet there is no reason to believe that the sac itself is much diseased below; in others, the breach is large, the skin remains hard and inflamed, and from the appearence of the sore, there is reason to suppose the whole inside of the bag to be in a diseased state; and in some cases, which have been much neglected or irritated by ill treatment, the cavity of the sacculus seems to be filled with a loose illnatured fungus, which gleets largely, and produces inflammation and excoriation of all the parts about.

"There is also another circumstance which sometimes is found to attend this disorder, viz. a carious state of the bones. This was by our forefathers supposed to be a frequent one, and was the principal reason for their so free use of caustic, cautery, and scalpra, in the treatment of it; but since the disease has been more minutely examined into, this circumstance has been found to be a very rare one. When the fistula lachrymalis is a symptom of the lues venerea, as it sometimes is, the bones are indeed often carious; but then, the fistula is not the original complaint, but produced secondarily, and is a consequence of the diseased state of the os ethmoides, and ossa spongiosa of the nose, and is not curable by any local means or applications, but depends entirely on the cure of the disease of which it is a symptom.

"I have also seen an abscess after the small-pox, which, by falling on the lachrymal bag, has made it all slough away, and leave the bones bare; which circumstance I have also seen attend the free use of strong escharotics applied to destroy what is called the cyst; but without the accession of some other disorder producing it, or the most absurd method of treating the complaint, I believe that a caries of the bones will very seldom be met with. Indeed, the combination of other diseases, either of the general habit, or affecting the same, or the neighbouring parts, does often make a very material difference, both in the appearance of the disorder, in the prognostic, and in the proper method of treating it, which therefore should always be inquired into; for instance, the patient is sometimes subject to an habitual ophthalmy, or lippitudo, which will add to the deformity, and give a good deal of additional trouble during the cure; an ozœna, or some other disease of the membrane, and cells of the ethmoid bone, or a polypose excrescence within the nose, are now and then combined with it; the habit is sometimes, as I have before observed, infected with the lues venerea, of which this disease may be a symptom; strumous glandular obstructions are its too frequent companions; and, what is worst of all, it is sometimes cancerous."

### TREATMENT OF THE FIRST STAGE OF THE FISTULA LACHRYMALIS.

Mr. Pott continues: "From what has been said, I think it will appear that this disease, in its primary and most simple state, consists in a detention or lodgment of mucus in the sacculus lachrymalis, in consequence of an obstruction of the natural passage from that bag into the nose; that by means of this lodgment the sacculus is distended, irritated, and sometimes inflamed; that the fluid which passes from the lachrymal gland over the eye to the puncta lachrymalia, being prevented by the fulness of the sac from getting into it, runs down the cheek; and therefore that the characteristic marks of the disorder, when recent, are a small tumour in the corner of the eye, an involuntary flux of serum down that side of the face, and a discharge of mucus through the puncta lachrymalia upon pressure.

"This lodgment, being originally produced by the stoppage of the natural duct, it follows, that the first curative intention is, the removal of that obstruction; which is sometimes practicable, but more often not; the degree of obstruction, its date, the state of the adjacent parts, and some other circumstances, rendering it more or less so in different subjects.

"That the inexperienced practitioner may be guarded against giving a hasty prognostic, or making attempts, which, however fatiguing to the patient, must in the end prove fruitless; and that he may be enabled to understand the disease more perfectly, I shall take the liberty to divide it into four general heads, or states, under which all its lesser distinctions may be comprehended.

"The first consists in a simple dilatation of the sacculus, and obstruction of the nasal duct, discharging upon pressure a mucus either quite clear, or a little cloudy; the skin covering the bag being entire and perfectly free from inflammation.

"In the second, the tumour is somewhat larger; the skin which covers it is in an inflamed state, but entire; and the discharge made through the puncta lachrymalia is of a pale yellow, or purulent colour.

"In the third, the skin covering the sacculus is become sloughy and burst, by which means the swelling is in some measure lessened; but the mucus, which while the skin was entire, used to be pressed out through the puncta lachrymalia, now discharges itself through the new aperture; the ductus ad nares, both in this and the preceding state, are not otherwise diseased, than by the thickening of its lining.

"In the fourth, the passage from the sacculus lachrymalis into the nose is totally obliterated, the inside of the former being either ulcerated, or filled up with a fungus, and attended sometimes with a caries of the bone underneath."

Our limits oblige us to pass over what Mr. Pott next states, concerning the practice of the ancients.

"In the first and most simple state of the disease, viz. that of mere obstruction, without inflammation, much pains have been taken to restore the parts to their natural state and use, without making any wound or division at all; the introduction of a probe, the injection of a fluid, and a constant compression made on the outside of the sacculus in the corner of the eye, are the principal means by which this has been attempted.

"Some few years ago, M. Anel made a probe of so small a size as to be capable of passing from the eyelid into the nose, being introduced at one of the puncta lachrymalia, and passing through the sacculus and duct; with which probe, he proposed to break through any small obstruction, which might be found in its passage.

"He also invented a syringe, whose pipe is small enough to enter one of the puncta, and by that means to furnish an opportunity of injecting a liquor into the sacculus and duct; and with these two instruments he pretended to be able to cure the disease whenever it consisted in obstruction merely, and the discharge was not much discoloured. The first of these, viz. the passage of a small probe through the puncta, has a plausible appearance, but will, upon trial, be found very unequal to the task assigned; the very small size of it, its necessary flexibility, and the very little resistance it is capable of making, are manifest deficiencies in the instrument; the quick sensation in the lining of the sac and duct, and its diseased state, are great objections on the side of the parts, supposing that it was capable of answering any valuable end, which it most certainly is not.

"That the passing a fine probe from one of the puncta lachrymalia into the nose is very practicable, I know from experience; but I also know from the same experience, that the pain it gives, and the inflammation it often excites, are much greater, than any benefit, which does or can arise from it.

"It is said that the principal use of this probe is to clear the little ducts leading from the puncta into the sacculus, and the obstruction of those ducts is often mentioned as a part of this disease; by which one would be led to suppose that it was a circumstance which frequently occurred, whereas it is seldom if ever met with, and when it does happen, can never produce the disease in question; the principal characteristic of which is, a discharge into the inner corner of the eye upon pressure made in the angle; this discharge is made from the sacculus, through the puncta, and proves that the latter are open; the passing a probe therefore through these seems to be perfectly unnecessary, since a stoppage of them would never give rise to that disease, which consists in an obstruction to the passage of any thing from the sac into the nose, and not from the eye into the sac.

"The syringe, if used judiciously while the disease is recent, the sac very little dilated, and the mucus perfectly clear, will sometimes be found serviceable; I have used it where, I think, it has been much so; I have by means of it injected a fluid through the sacculus into the nose, and in two or three instances have effected cures by it; but I have also often used it ineffectually; it gives no pain, and a few trials render the use of it very little troublesome."*

The screw, invented by Fabricius ab Aquapendente, for compressing the lachrymal sac, being now never used, we need not follow Mr. Pott in shewing its inapplicableness.

Mr. Pott continues; "Besides these means of attempting a cure without incision, the gentlemen of the French Academy have favoured us with some others, such as the introduction of a probe into the lower part of the nasal duct within the nose, the injection of a fluid by the same orifice, the passing a seton from the punctum lachrymale superius through the sacculus and duct, and out at the nostril, there to remain till the cure is completed; and, for those purposes, they have invented, and given figures of a number of probes, syringes, and many other instruments, which, they say, have been very successfully used; far be it from me to say that they have not, or to prevent any body from trying those, or any other means, by which mankind may be cured of diseases with the least possible fatigue and pain; but from the experiments which I have made of most of these processes, I must beg leave to suspend my assent to their general utility, or even to their frequent practicability.

"Repeated trials upon dead subjects will undoubtedly enable a man to pass the probe, or perhaps now and then the seton, but he will also find it often absolutely impracticable; and, in the few instances, in which he may chance to succeed, as to this attempt, what will in general be the consequence? not what the writers on these subjects have taught him to believe, a cure, but a sense of pain, and degree of inflammation, which the patient, before such attempts were made, was free from; an exasperation of the disease, and a loss of much time, as I have more than once experienced. To which consideration may be added, that infants and young children are very often afflicted with this disorder, and that such processes as these are absolutely impracticable upon them, &c.

"Anel's syringe I have used successfully, and think it may now and then be very well worth trying, in recent cases more especially, as it may always be used without giving any pain, or running the risk of raising an inflammation; but I must also beg leave to observe, that if the bag is not much dilated, the mucus clear, the skin and cellular membrane uninflamed, and the parts above soft and easy, if the patient will take care not to suffer too great an accumulation, will by the frequent use of a vitriolic collyrium, keep the eye-lids clean and cool, and carefully avoid such things as irritate the membrana narium, or occasion a sudden flux of lymph from the lachrymal gland, the disease may for many years, nay often for life, be kept from being very troublesome, or inconvenient, without any surgery at all." (*Pott.*)

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* The following passage will shew, that the practice of Anel, was first received with much envy and opposition, and that every attempt was made to strain sentences in old works beyond their allowable meaning, so as to lessen the merit of the proposal, and deprive it of the recommendation of originality. Cette manière de traiter la fistule lachrymale n'étoit point connue lorsque Anel l'a exécutée. Cependant elle ne paroît pas entierement nouvelle; Pline le jeune parle, dans le lib. 7, cap. 53, de son Histoire naturelle, d'un certain Caius Julius, Medécin, qui traitoit quelques maladies des yeux, avec des stylets qu'il introduisoit dans l'oeil. *Specillum per oculos trahens . . . . dum inungit specillum per oculos trahens.* Ces passages n'ont point échappé au savant Morgagni, qui les rapporte dans sa sixieme adversaire, *animad.* 64, ou il parle de la méthode d'Anel. La méthode d'injecter les points lacrymaux ne lui a pas paru parfaitement nouvelle. Plater parle d'une fille attaquée de la fistule lacrymale, dont on injecta les voies lacrymales. Morgagni rapporte quelques autres faits qui peuvent servir à l'histoire des injections; mais, il faut avouer que les Ecrivains avoient parlé de cette méthode de sonder, et de celle d'injecter, en des termes si obscurs, et si laconiquement, que les Médecins ni les Chirurgicus n'eussent pu parvenir à l'exécuter, en la suivant literalment. Anel peut donc passer pour le véritable auteur; c'est d'après ses travaux qu'on a connu ceux des autres Ecrivains, et non d'après autrui qu'il est parvenu à sonder et à injecter les points lacrymaux. Cependant Anel trouva beaucoup de critiques et très peu d'approbateurs. Plusieurs Médecins Italiens l'attaquerent, quelques Chirurgiens François parlerent contre lui d'une manière indécente. L'Académie des Sciences jugea mieux ses travaux. Elle trouva ses observations également nouvelles et ingénieuses." (*Histoire de l'Anatomie et de la Chirurgie, par M. Portal, Tom.* 4, *p.* 398.) With regard to *specillum per oculos trahens*, it appears to me, that the interpretation above laid down is quite unwarranted; and as for the introduction of injections into the lachrymal sac, Anel's predecessors, in all probability, injected the fluid through an ulcerated opening, or a puncture, and, not through one of the puncta lachrymalia, as devised and practised by Anel himself. It is the latter method alone, that has peculiarity and merit.

In 1780, Sir William Blizard proposed, instead of injecting water, to introduce quicksilver through a small pipe communicating with a long tube full of this fluid. The specific gravity of the quicksilver, when the sac was distended with it, he believed would have more power, than water propelled through a syringe, to remove the lachrymal obstruction

Mr. Ware, after trying Sir William Blizard's plan, gave the preference to Anel's syringe, with which he generally injects warm water, through the lower punctum lachrymale, into the lachrymal sac, and puts a finger over the superior punctum to prevent the fluid from escaping through it. With this finger, the lachrymal sac should also be occasionally compressed, in order to assist the determination of the water downward into the nose. Mr. Ware has sometimes used the injection thrice a day, though, in general, much less frequently; and, he says, the success he has experienced is considerable. (See *Ware on the Epiphora.*)

"I in general begin the treatment by injecting some warm water through the inferior punctum lachrymale, and I repeat the operation four or five days in succession. If, in this space of time, none of the water pass through the duct into the nose, and if the watering of the eye continue as troublesome as it was before the injection was employed, I usually open the angular vein, or direct a leech to be applied near the lachrymal sac; adding here a caution, that the leech be not suffered to fix on either of the eyelids, lest it produce an extravasation of blood in the adjacent cells. About the same time that blood is taken away in the neighbourhood of the eye, I usually vary the injection, and try the effects either of a weak vitriolic, or anodyne, lotion. In some instances, also, when I have found it impossible, after several attempts, to inject any part of the liquid through the duct, I have introduced a golden probe, about the size of a bristle, through the superior punctum lachrymale, and, attending to the direction of the duct, have insinuated its extremity through the obstruction, and conveyed it fully into the nose; immediately after which I have found, that a liquid, injected through the inferior punctum, has passed without any difficulty; and by repeating these operations, for a few successive days, I have at length established the freedom of the passage, and completed the cure. In other instances, I have recommended a strongly stimulating sternutatory to be snuffed up the nose, about an hour before the time of the patient's going to rest, which, by exciting a large discharge from the schneiderian membrane, has sometimes also greatly contributed to open the obstruction in the nasal duct.

"Cases occur very rarely which may not be relieved by some of the means above related." (*Ware's Additional Remarks on the Epiphora.*)

When the discharge has been fetid, Mr. Ware has sometimes found, that a vitriolic lotion, injected into the sac, has quickly corrected the quality of the matter.

Scarpa, in his *Osservazioni sulle principali Malattie degli Occhi*, maintains, that the chief part of the yellow viscid matter, which accumulates in the lachrymal sac, is secreted by the lining of the eye-lids, and by the little glands of Meibomius; and that the altered quality of this secretion has a principal share in the cause of the disease. He states, that the truth of this fact may at once be ascertained by everting the eye-lids; and especially the lower one of the affected side; and by comparing them with those of the opposite eye. The former will always exhibit an unnatural redness of the internal membrane, which has a villous appearance, all along the extent of the tarsus, while their edges are swollen; and numerous varicose vessels are distinguishable on its surface. The follicles of Meibomius, are also turgid and prominent.

Hence, Scarpa advises making such applications to the inside of the eye-lids, as have a tendency to improve the quality of the secretion from them, at the same time, that attempts are made to remove the obstruction in the ductus nasalis. Mr. Ware, indeed, had previously noticed, that such treatment may occasionally be proper.

"When an epiphora is occasioned by an acrimonious discharge from the sebaceous glands on the edges of the eye-lids, it must be evident, that injections into the sac will be very insufficient to accomplish a cure, because the sac is not the seat of the disorder. The remedies that are employed must be directed, on the contrary, to the ciliary glands themselves, in order to correct the morbid secretion that is made by them; and for this purpose, I do not know any application that is so likely to prove so effectual as the unguentum hydrargyri nitrati, of the new London Dispensatory, which should be used here in the same manner, in which it is applied in common cases of the psorophthalmy. It will be proper to cleanse the eye-lids every morning, from the gum that collects on their edges during the night, with some soft unctuous applications; and I usually advise to apply to them, two or three times, in the course of the day, a lotion composed of three grains of white vitriol, in two ounces of rose, or elder-flower, water."

Mr Ware very judiciously censures the plan of applying collyria to the eye by means of linen, wet in them; and he recommends eye-glasses for the purpose, or insinuating the fluid, between the eye and eye-lids, with a camel-hair pencil thoroughly wet in the application. (*Additional Remarks on the Epiphora.*)

Scarpa is also an advocate for washing the eye, three or four times a day, with a vitriolic collyrium; and, besides praising the ointment used by Mr. Ware, he recommends Janin's ophthalmic ointment, to be smeared over the margins and lining of the eye-lids, every morning and evening.

℞. *Adipis. Suillæ. Tutiæ præp. Bol. Armen. sing* ʒij *Calcis Hydrarg. alb.* ʒj. *Misce.* To be used at first lowered with a larger proportion of lard, than is here ordered.

### TREATMENT OF THE SECOND AND THIRD STAGES OF THE FISTULA LACHRYMALIS.

When the disease, says Mr. Pott, is beyond the simple state just described, that is, when the parts round about are much, or constantly inflamed, or the skin, covering the tumour, is burst, there is something more to be done, if a cure is intended. In this state, an opening in the upper part of the sacculus lachrymalis becomes in general absolutely necessary; and, as a wound, made by a knife, leaves a much less disagreeable scar, than that which necessarily follows the bursting of the skin, one being a mere simple division, the other a loss of substance, it will always be found best to anticipate the accident of bursting, by making an opening, as soon as the integuments are in such a state as to threaten it.

If the sacculus is already burst, the opening, if necessary, is to be enlarged with a knife, or dilated. The incision made, the sacculus should be moderately distended with dry lint, or prepared sponge; by which means an opportunity will be gained, in two or three days, of knowing the state of the inside of the sac, and of the ductus nasalis; if the former is neither sloughy, nor otherwise diseased, and the obstruction in the latter but slight, sometimes after a free discharge has been made, for some days, and the inflammation, occasioned by the first operation, is gone off, the sac contracts itself, a superficial dressing, with moderate pressure, heals the sore, the lachrymal fluid resumes its wonted course, and the disease disappears. (*Pott.*)

When this simple method fails, the point to be aimed at, says Mr. Pott, is to render the nasal duct pervious; and, for this purpose, the passage from the sac to the nose, must be gradually distended, by passing either a probe, or a piece of catgut, or a bougie, gently into it, as far as it will go, and repeating it occasionally, until it is got quite through. (*Pott.*)

Such was the practice commonly pursued, till M. Pellier, and Mr. Wathen, recommended introducing a metallic tube down the ductus nasalis, and leaving it for a time in that situation, with a view of preventing the duct, after it had been made pervious, from closing again. It seems unnecessary to enter into a detail of their methods, which have now universally given place to a most simple mode of practice, devised by Mr. Ware, and explained by him in the following terms.

"Whenever a patient applies to me for relief, on account of an obstruction in the lachrymal passage, I always think it right to attempt to clear the canal from any inspissated mucus that may be lodged in it, by injecting some warm water through the inferior punctum lachrymale; joining with it, when necessary, a trial of the other remedies that have been proposed in the two papers on the epiphora, which were laid before the public in the years 1792 and 1795. But if, after the use of these for about a week or ten days, there be not some perceptible advance towards a cure, or, if, from the long continuance of the obstruction, there be reason to fear that it is too firmly fixed to yield to this easy mode of treatment, I do not hesitate to propose the operation which is now to be described. The only persons, with respect to whom I entertain any doubts as to the propriety of this opinion, are infants. In such subjects, I always think it advisable to postpone the operation, unless the symptoms be particularly urgent, until they are eight or nine years old.

"If the disease has not occasioned an aperture in the lachrymal sac, or if this aperture be not situated in a right line with the longitudinal direction of the nasal duct, a puncture should be made into the sac, at a small distance from the internal juncture of the palpebræ, and nearly in a line drawn horizontally from this juncture towards the nose, with a very narrow spear-pointed lancet. The blunt end of a silver probe, of a size rather smaller than the probes, that are commonly used by surgeons, should then be introduced through the wound, and gently, but steadily, be pushed on in the direction of the nasal duct, with a force sufficient to overcome the obstruction in this canal, and until there is reason to believe that it has freely entered into the cavity of the nose. The position of the probe, when thus introduced, will be nearly perpendicular; its side will touch the upper edge of the orbit; and the space between its bulbous end in the nose and the wound in the skin will usually be found, in a full-grown person, to be about an inch and a quarter, or an inch and three-eighths. The probe is then to be withdrawn, and a silver style of a size nearly similar to that of the probe, but rather smaller, about an inch and three-eighths in length, with a flat head like that of a nail, but placed obliquely, that it may sit close on the skin, is to be introduced through the duct, in place of the probe, and to be left constantly in it. For the first day or two after the style has been introduced, it is sometimes advisable to wash the eye with a weak saturnine lotion, in order to obviate any tendency to inflammation which may have been excited by the operation; but this in general is so slight, that I have rarely had occasion to use any application to remove it. The style should be withdrawn once every day for about a week, and afterwards every second or third day. Some warm water should each time be injected through the duct into the nose, and the instrument be afterwards replaced in the same manner as before. I formerly used to cover the head of the style with a piece of dyachylon plaster spread on black silk; but have of late obviated the necessity for applying any plaster by blackening the head of the style with sealing wax."

Mr. Ware did not on first trying this method, expect any relief, till the style was left off. However, he was agreeably disappointed, to find, that the watering of the eye ceased, as soon as the style was introduced, and the sight became proportionably more useful and strong.

The wound, which Mr. Ware makes in the sac, when there is no suitable ulcerated aperture, is only just large enough to admit the end of the probe, or style; and this soon becomes a fistulous orifice, through which the style may be passed without the least pain. In short, in about a week or ten days, the treatment becomes so easy, that the patient, or any friend, is fully competent to do what is necessary. It merely consists in withdrawing the style, two, or three times a week, occasionally injecting some warm water, and then replacing the instrument as before.

Some, finding no inconvenience from the style, and being afraid to leave it off, wear it for years; many others disuse it in about a month, or six weeks, and continue quite well. The ulcerations, sometimes existing over the lachrymal sac, commonly heal, as soon as the tears can pass down into the nose; but Mr. Ware mentions two instances, in which such sores did not heal, until a weak solution of the hydrargyrus muriatus, and bark, were administered. (See *Ware on the Fistula Lachrymalis.*)

### TREATMENT OF THE FOURTH STAGE OF THE FISTULA LACHRYMALIS.

The last stage is that, in which the natural passage, from the sacculus to the nose, is so diseased as to be quite obliterated; or in which the bones are sometimes found to be carious.

The methods, hitherto described, have all been calculated to preserve the natural passage; they are sometimes successful; but, when they are not, there is no chirurgical means left, but to attempt the formation of an artificial one in its stead. The upper and hinder part of the sacculus lachrymalis is firmly attached to the os unguis, a small, and very thin bone, just within the orbit of the eye; which bone is so situated, that if it be by any means broken through, or removed, the two cavities of the nose and of the orbit, communicate with each other; consequently, the os unguis forms the partition between the hinder part of the lachrymal bag, and the upper part of the cavity of the nose; and it is by making a breach in this partition, that we attempt the formation of an artificial passage for the lachrymal fluid. (*Pott.*)

The cautery has now been long disused for making an aperture in the os unguis; and there are different instruments recommended for the purpose, such as a large, strong probe, a kind of gimblet, a curved trocar, &c.; each of which, says the above practical writer, if dextrously, and properly applied, will do the business very well; the one necessary caution is, so to apply whatever instrument is used, that it may pierce through that part of the bone which lies immediately behind the sacculus lachrymalis, and not to push too far up into the nose, for fear of injuring the os spongiosum behind, while it breaks its way. Mr. Pott adds, that he himself has always used a curved trocar, the point of which should be turned obliquely downward, from the angle of the eye, towards the inside of the nose. The accomplishment of the breach will be known by the discharge of blood from the nostril, and of air from the wound, upon blowing the nose. Care must be taken to apply the instrument to the part of the bone, anterior to the perpendicular ridge, which divides it.

As soon as the perforation is made, a tent of lint should be introduced, of such size as to fill the aperture, and so long as to pass through it into the cavity of the nose: this should be permitted to remain in two, three, or four days, till the suppuration of the parts renders its extraction easy; and, after that, a fresh one should be passed every day, until the clean granulating appearance of the sore makes it probable, that the edges of the divided membrane are in the same state. The business now is to prevent the incarnation from closing the orifice; for which purpose, the end of the tent may be moistened with spir. vitriol. ten. or a piece of lunar caustic, so included in a quill, as to leave little more than the extremity naked, may at each dressing, or every other, or every third day, be introduced; by which the granulations will be repressed, and the opening maintained: and when this has been done for some little time, a piece of bougie of proper size, or a leaden cannula, may be introduced instead of the tent; and leaving off all other dressing, the sore may be suffered to contract as much as the bougie will permit; which should be of such length, that one extremity of it may lie level with the skin in the corner of the eye, and the other be within the nose.

The longer time the patient can be prevailed upon to wear the bougie, the more likely will be the continuance of the opening; and, when it is withdrawn, the external orifice should be covered only by a superficial pledget, or plaster, and suffered to heal under moderate pressure. (*Pott.*)

After the perforating instrument is withdrawn, Mr. Ware recommends a nail-headed style, about an inch long, to be introduced through the aperture, in the same way in which it is introduced through the nasal duct, in cases, in which the obstruction is not so great as to prevent its passing in this direction; and it may remain here with as much safety, as in this last-mentioned instance, for as long a time as its continuance may be thought necessary to establish the freedom of the communication.

Mr. Ware is undoubtedly deserving of much honour for the improvement of this part of surgery; the following short passage of his own work fully shews in what his merits consist. "It may, perhaps, be thought, that the operation, which I have taken the liberty to recommend, has a close resemblance to that which was proposed by the late Mr. Pott. It will be found to differ from it, however, in many essential respects. Mr. Pott, for instance, as well as Mr. Warner and Mr. Bell, advises the operator to make a large opening into the lachrymal sac. On the contrary, I have proposed to make a small one. These gentlemen, again, afterwards recommend different kinds of dressings; some of which are difficult to be applied, and painful in their action. The dressing, which I have proposed, is confined simply and solely to a silver nail-headed style. Their operation is performed, and their dressings employed, in order to form a communication, through which the tears may afterward pass into the nose; and until their passage is formed, and the necessity for further dressings ceases, they do not encourage any hope, that the disorder will be removed. Experience, however, teaches me, that as soon as the style is introduced, the disorder immediately ceases; and the tears pass at once into the nose, either through the natural nasal duct, or through the perforation that is made by the operation in the thin part of the os unguis." (*Ware on the Fistula Lachrymalis.*)

The works, containing the most valuable information, relative to the present subject, are the *Mémoires de l'Academie de Chirurgie, Tom. 5, Edit. 12mo. in which are several essays on the fistula lachrymalis: viz. one by M. Bordenave, entitled, "Examen des Réflexions critiques de M. Molinelli, insérées dans les Mémoires de l'Institut de Bologne, contre le Mémoire de M. Petit, sur la Fistule Lachrymale, inséré parmi ceux de l'Acad. Royale des Sciences de Paris. Année 1734. Another essay by M. de la Forest, styled "Nouvelle Méthode de traiter les Maladies du Sac Lachrymal, nommées communément Fistules Lachrymales." A third by M. Louis, called "Réflexions sur l'Opération de la Fistule Lachrymale." Anel has described his plan of treatment in various works: "Observation singulière sur la fistule lacrymale, dans laquelle l'on apprendra la méthode de la guérir radicalement." Turin, 1713, in 4to. "Nouvelle Méthode de guérir les fistules lacrymales." Turin, 1713, in 4to. "Suite de la Nouvelle Méthode," &c. ibid. 1714, in 4to. "Dissertation sur la nouvelle découverte de l'hydropisie du conduit lacrimal," Paris, 1716, in 12mo. And, lastly, Anel has published in the Mém. de l'Acad. des Sciences, année 1713, "Précis de sa nouvelle manière de guérir les fistules lacrymales." Sabatier's Médecine Opératoire, Tom. 2, p. 371—406. Edit. 1. Richter's Anfangsgrunde der Wundarzneykunst, Band 2, Kap. 11. Pott's observations relative to the disorder of the corner of the eye, commonly called the Fistula Lachrymalis; Ware on the Epiphora and Fistula Lachrymalis; Scarpa sulle principali Malattie degli Occhi. Capo 1. Wathen's Tube for the Fistula Lachrymalis. Lond. 1781.*

**FISTULÆ IN PERINÆO.** When the methods recommended for the removal of strictures (See *Urethra, Strictures of*) have not been attempted, or not succeeded, nature endeavours to relieve herself by making a new passage for the urine, which, although it often prevents immediate death, yet, if not remedied, is productive of much inconvenience and misery to the patient through life. The mode by which nature endeavours to procure relief, is by ulceration on the inside of that part of the urethra which is enlarged, and within the stricture.

The ulceration commonly begins near, or close to the stricture, although the stricture may be at a considerable distance from the bladder. The stricture is often included in the ulceration, by which means it is removed; but, unluckily, this does not constantly happen. The ulceration is always on the side of the urethra, next to the external surface.

The internal membrane and substance of the urethra having ulcerated, the urine readily gets into the loose cellular membrane of the scrotum and penis, and diffuses itself all over those parts; and as this fluid is very irritating to them, they inflame and swell. The presence of the urine prevents the adhesive inflammation from taking place; it becomes the cause of suppuration wherever it is diffused, and the irritation is often so great that it produces mortification, first in all the cellular membrane, and afterwards in several parts of the skin; all of which, if the patient live, slough away, making a free communication between the urethra and external surface, and producing *fistulæ in perinæo.*

However, when the ulceration takes place further back than the portion of the urethra, between the glans penis and membranous part of this canal, the abscess is generally more circumscribed.

The urine sometimes insinuates itself into the corpus spongiosum urethræ, and is immediately diffused through the whole, even to the glans penis, so as to produce a mortification of all those parts.

Although the ulceration of the urethra may be in the perinæum, yet the urine generally passes easily forwards into the scrotum, which contains the loosest cellular substance in the body; and there is always a hardness, extending along the perinæum to the swelled scrotum, in the track of the pus.

Ulceration can only be prevented by destroying the stricture; but, when the urine is diffused in the cellular membrane, the removal of the stricture will generally be too late to prevent all the mischief, although it will be necessary for the complete cure. Therefore, an attempt should be made to pass a bougie, for perhaps the stricture may have been destroyed by the ulceration, so as to allow this instrument to be introduced. When this is the case, bougies must be almost constantly used, to procure as free a passage forwards, in the right way, as possible. When the bougie cannot pass, the application of caustic would in many cases be too slow in its operation, and, in others, cannot be tried, by reason of the situation of the stricture.

While we are attempting to cure the stricture, antiphlogistic measures, particularly bleeding, are to be adopted. The parts should be exposed to the steam of hot water; the warm bath made use of; opium and turpentine medicines given by the mouth, and in glysters; with a view of diminishing any spasmodic affection. But, all these proceedings are often insufficient; and, therefore, an immediate effort must be made, both to unload the bladder, and prevent the further effusion of urine, by making an opening into the urethra, somewhere beyond the stricture, but, the nearer to it, the better.

Introduce a director, or some such instrument into the urethra, as far as the stricture, and make the end of it as prominent as possible, so as to be felt; which, indeed, is often impossible. If it can be felt, it must be cut upon, and the incision carried on a little farther, towards the bladder, or anus, so as to open the urethra beyond the stricture. This will both allow the urine to escape, and destroy the stricture. If the instrument cannot be felt, at first, by the finger, we must cut down towards it; and, on afterwards feeling it, proceed as above.

When the stricture is opposite the scrotum, as the opening cannot be made in this situation, it must be made in the perinæum, in which case, there can be no direction given by an instrument, as one cannot pass sufficiently far, and the only guide is our anatomical knowledge. The opening being made, proceed as directed in the cure of a false passage. (See *Urethra, False Passage of.*) In whichsoever way the operation is done, a bougie, or a catheter, which is better, must afterwards be introduced, and the wound healed over it.

When the inflammation, from the extravasation of urine, is attended with suppuration and mortification, the parts must be freely scarified, in order to give vent both to the urine and pus. When there is sloughing, the incisions should be made in the mortified parts.

Sometimes, when the urethra is ulcerated, and the cellular membrane of the penis and prepuce is so much distended, as to produce a phymosis, it is impossible to find the orifice of the urethra.

Frequently the new passages for the urine do not heal, on account of the stricture not being removed: and even when this has been cured, they often will not heal, but become truly fistulous, and produce fresh inflammations and suppurations, which often burst by distinct openings. Such new abscesses and openings often form, in consequence of the former ones having become too small, before the obstruction in the urethra is removed.

Such diseases sometimes bring on intermittent disorders, which do not yield to bark; but do not recur, when the fistulæ, and disease of the urethra, have been cured.

In order to cure fistulæ in perinæo, unattended with the above described urgent symptoms, the urethra must be rendered as free as possible, and, this alone is often enough; for, the urine finding a ready passage forwards, is not forced into the internal mouth of the fistulæ, so that these heal up. The cure of the strictures, however, is not always sufficient, and the following operation becomes indispensable.

The sinuses are to be laid open in the same manner as other sinuses, which have no disposition to heal. In doing this, as little as possible of the sound part of the urethra must be opened. Hence, the surgeon must direct himself to the inner orifice of the fistulæ, by means of a staff, introduced (if possible) into the bladder, and a probe passed into one of the fistulous passages. The probe should be first bent, that it may more readily follow the turns of the fistula. When it can be made to meet the staff, so much the better; for, then the operator can just cut only what is necessary.

When the fistula is so straight, as to admit of a director being introduced, this instrument is the best. When neither the probe, nor the director, can be made to pass as far as the staff, we must open the sinuses as far as the first instrument goes, and then search for the continuation of the passage, for the purpose of laying it open.

Having divided the fistulæ, as far as their termination, in the urethra, a catheter should be introduced, and worn at first, almost constantly. This is better than a bougie, which must be frequently withdrawn to allow the patient to make water, and it often could not be introduced again without getting entangled in the wounds.

Whatever instrument is used for keeping the passage clear and open, while the sores are healing, whether the sores are the consequence of the causes of the fistula, or the above operation, there is, in many cases, a limited time for its employment. At first, it often assists the cure; but, in the end, it may obstruct the healing, by acting at the bottom of the wound, as an extraneous body. Hence when the sores become stationary, let the catheter be withdrawn, and introduced only occasionally.

Even after the sores are well, the bougie may afterwards be used, in order to determine whether the passage is free from disease.

When fistulæ in perinæo have been laid open, the wounds are to be at first dressed down to the bottom as much as possible, which will prevent the reunion of the parts first dressed, and make the granulations shoot from the bottom, so as to consolidate the whole by one bond of union. (See *Treatise on the Venereal Disease, by John Hunter.*) Additional observations upon this subject, and, in particular, the opinions of Desault concerning it, will be found in the article, *Urinary Abscesses and Fistulæ.*

**FISTULA SALIVARY.** (See *Parotid Duct.*)

**FLUCTUATION.** (from *fluctuo*, to float.) The perceptible motion communicated to any collection of purulent matter, or other kind of fluid, by applying the fingers to the surface of the tumour, and pressing with them alternately, in such a manner, that the fingers of one hand are to be employed in pressing, while those of the other hand remain lightly placed on another part of the swelling. When the ends of one set of fingers are thus delicately applied, and the surgeon taps, or makes repeated pressure with the fingers of the other hand, the impulse, given to the fluid, is immediately perceptible to him, and the sensation, thus received, is one of the principal symptoms, by which practitioners are enabled to discover the presence of fluid in a great variety of cases. Great skill in ascertaining by the touch the presence of fluid in parts, or being endued with the *tactus eruditus,* as it is termed, distinguishes the man of experience as remarkably, perhaps, as any quality that can be specified.

When the collection of fluid is very deeply situated, the fluctuation is frequently exceedingly obscure, and sometimes not at all distinguishable. In this circumstance, the presence of the fluid is to be ascertained by the consideration of other symptoms. For example, in cases of hydrops pectoris and empyema, surgeons do not expect to feel the undulation of the fluid in the thorax with their fingers; they consider the patient's difficulty of breathing, the uneasiness attending his lying upon one particular side, the œdema of the parietes of the chest, the dropsical affection of other parts, the more raised and arched position of the ribs on the affected side, the preceding rigors, fever, and several other circumstances, from which a judgment is formed, both with regard to the presence and the peculiar nature of the fluid.

**FOMENTATION.** By a fomentation, surgeons commonly mean the application of flannel or some other substance, wet with warm water, or some medicinal decoction. Fomentations are chiefly of use in surgery in relieving pain, and inflammation, and in promoting suppuration, when this is desirable. Some particular decoctions, however, are used for fomentations, with a view of affecting by means of their medicinal qualities, scrofulous, cancerous, and other sores, of a specific nature. We shall just mention a few of the most useful fomentations in common use.

**FOMENTUM AMMONIÆ MURIATÆ.** ℞. *Fomenti Communis* ℔ij. *Ammon. Mur.* ℥j. *Spirit. Camph.* ℥ij.

Just before using the hot decoction, add to it the ammonia muriata, and spirit. Said to be of service to some indolent ulcers; and, perhaps, it might be of use in promoting the absorption of some tumours, and suppuration in others.

**FOMENTUM CICUTÆ.** ℞. *Fol. Cicut. recent.* ℔j. *vel Fol. Cicut. exsiccat.* ℥iij. *Aq. Comm.* ℔iij. *Coque usque reman.* ℔ij. *et cola.*

This fomentation is considered, as a very proper one for many scrofulous, cancerous, and phagedenic ulcers.

**FOMENTUM CHAMÆMELI.** ℞. *Lini contusi* ℥j. *Chamæmeli* ℥ij. *Aq. Distillat.* ℔vj. *Paulisper coque, et cola.*

This is a common fomentation, for ordinary purposes.

**FOMENTUM GALLÆ.** ℞. *Gallæ Contusæ* ℥ss. *Aq. Ferventis* ℔ij. *Macera per horam, et cola.* Used for the prolapsus ani. It is sometimes also employed, as a cold application, in cases of hemorrhoids.

**FOMENTUM PAPAVERIS ALBI.** ℞. *Papav. Alb. Exsiccati* ℥iv. *Aq. Pur.* ℔vj. Bruise the poppies, put them in the water, and boil the liquor, till only a quart remains, which is to be strained. This fomentation is an excellent one, for very painful inflammations of the eyes, and for numerous ulcers, and other diseases, attended with intolerable pain.

**FORCEPS,** is an instrument much employed in surgery for a variety of purposes, and having accordingly various constructions. The general design, however, of every surgical forceps is to take hold of substances, which cannot be conveniently grasped with the fingers; and, of course, the instrument is always formed on the principle of a pair of pincers, having two blades, either with, or without handles, according to circumstances. The smallest forceps is that which is employed in the operation of extracting the cataract, and which is useful for removing any particles of opaque matter from the pupil, after the chief part of the crystalline lens has been taken away.

Another forceps, of larger size, is that used for taking up the mouths of the arteries, when these vessels require the ligature, in cases of hemorrhage. This instrument is also frequently employed for taking dressings off sores, removing pieces of dead bone, foreign bodies from wounds, and, particularly, for raising the fibres, which are about to be cut, and all operations, where careful dissection is required. This forceps resembles that, which is contained in every case of dissecting instruments, and is often called the *artery,* or *dissecting* forceps, from its more important uses.

Neither of the foregoing forceps is made with handles; each opens by its own elasticity; and the ends of the blades only come into contact, when pressed together by the surgeon.

The following kinds of forceps are constructed with handles, by means of which they are both opened and shut:

1. The common forceps, contained in every pocket case of surgical instruments, and used for removing dressings from sores, extracting dead pieces of bone, foreign bodies, &c.

2. Larger forceps, employed for extracting polypi.

3. Forceps of different sizes and constructions, used in the operation of lithotomy, for taking the stone out of the bladder, or for breaking the calculus, when it is too large to be extracted in an entire state.

**FRACTURE.** (from *frango,* to break.) Is a solution of continuity of one, or more bones, produced in general by external force; but, occasionally, by the powerful action of muscles, as is often exemplified in the broken patella.

The subject of fractures is so interesting a branch of surgery, and the accidents themselves so frequent and important, that the little which English surgeons have done for the improvement of this part of their profession, cannot but cause equal surprise and regret. Mr. Pott, it is true, made many excellent observations on the treatment of fractures in general; and his remarks on compound fractures in particular are the best which are extant; but what surgeon will now presume to defend the weak arguments, upon which he has founded the doctrine of paying unqualified attention to the relaxation of the muscles, as if this were an object, which should constantly supersede every other consideration, and invariably regulate the posture of the limb? I have no hesitation in declaring my own belief, that the doctrine and practice recommended by Mr. Pott, in regard to fractured thighs, have done considerable harm, and the more so, as coming from a man, who was deservedly looked upon as one of the best and most experienced judges of surgical practice. Many a surgeon in this country implicitly believed every thing, which was asserted by so able a master, and the very observations, which some years ago were here considered to be the glory of their author, and the pride of English surgery, are now exposed by the surgeons of neighbouring countries, as specimens of our wrong precepts and bad practice. M. Roux, in fact, has had but too much room for animadversion upon this subject. We have not only not made a single improvement of consequence in the treatment of any particular fracture, but the generality of our surgical writers have given the most faulty and imperfect account of the diagnosis, and every thing else relating to these accidents. What is worse, a view of our practice conveys no better opinion of this part of our surgery. Observe the care and neatness, with which a French surgeon applies the bandages, and splints, and consider how well every indication is accomplished by his apparatus, and you will find great cause both for admiration and imitation. On the other hand, see the slovenly way, in which an English surgeon generally puts on the splints and roller, and the unscientific method, in which he usually treats a fractured thigh, or clavicle, and you cannot fail to be ashamed of the comparison. This was a matchless opportunity for M. Roux to draw a parallel in favor of French surgery, and of course he has not neglected it, many pages of his work being devoted to an explanation of the many improvements Desault made; the little, or rather the nothing, which we have done; and the errors, to which we unfortunately still adhere. (See *Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise*, p. 173, *&c.*) It is to be hoped, however, that the period has now arrived, when we shall give to the study of fractures the time, the attention, and the importance, which it claims; and when even the young hospital pupil will not be convinced, that his lecturer by one or two cursory discourses can have done justice to the subject.

In this article, my plan is to follow the arrangement pursued by Boyer, in his "Traité des Maladies Chirurgicales, T. 3." I shall first speak of fractures in general, and allot separate sections to the consideration of; 1. Their differences; 2. Their causes; 3. Their symptoms; 4. Their prognosis; 5. Their treatment; 6. The formation of callus.

The subject will then conclude with a full account of the symptoms, causes, and treatment of the fractures of particular bones.

## SECTION I.

### *Differences of Fractures.*

The differences of fractures depend upon what bone is broken; what portion of it is fractured; the direction of the fracture; the respective position of the fragments; and, lastly, upon circumstances accompanying the injury, and making it simple, or variously complicated.

1. *In respect to the bone affected.* Sometimes it is one of the broad bones, as the scapula, the sternum, or the os ilium. Sometimes, it is a short bone, like the os calcis; but, far more commonly it is one of the long bones. The situation and functions of the broad bones render their fractures unfrequent. The bones of the skull are the only exception to this remark, for they are often broken; but, here the assistance of the surgeon is required less for the solution of continuity itself, than for the affection of the brain, and the extravasation of blood, with which the case is apt to be combined. Fractures of the short bones are still more unusual, because these bones, being nearly equal in their three dimensions, are capable of greater resistance, and are not much within the reach of external violence. Besides, most of them are but little exposed to the operation of outward force, by their situation, or functions. Hence, unless limbs are crushed, fractures of short bones are almost always caused by the action of the muscles, the ordinary cause of the broken patella, olecranon, and os calcis. The long bones, which serve as pillars, or arches of support, or levers, are on this account very liable to fractures.

2. *In respect to the part of the bone broken.* Bones may be fractured at different points of their length. Most commonly, their middle portion is broken, and, in this circumstance, they usually break like a stick, which has been bent beyond its extensibility by a force applied at each end of it. Sometimes the fracture occurs more or less near the extremities of the bone, which is always an unfavourable event, as will be explained in considering the prognosis. Lastly, the bone is sometimes broken in several places, and the injury may be produced by two different causes, which have operated successively, or simultaneously, upon the broken parts of the bone; or it may be occasioned by one single cause, which has acted at the same moment upon several points of it. These distinctions of fractures, deduced from their particular situation, (says Boyer) are not merely scholastic refinements: they have truly an important influence over the prognosis and treatment, as will be hereafter seen.

3. *In respect to the direction, in which the bone is broken.* A bone may be fractured in various ways, and the fracture receives different names, according to its direction in regard to the axis of the bone. Thus, fractures are distinguished into *transverse*, and *oblique*. The obliquity renders the surface of the injury larger, and materially increases the difficulty of maintaining the ends of the bone in contact, after they have been set. Oblique fractures are subject to considerable variety, which depends upon the degree of their obliquity, and whether they are partly oblique and partly transverse. When a bone is broken in different

places at once, and divided into several fragments, or splinters, the fracture is termed *comminuted.*

Duverney admitted another class of fractures, viz. *longitudinal.* (See *Traité des Maladies des Os, T.* 1, *p.* 167.) But. M. J. L. Petit regarded this species as only imaginary, because he conceived, that any blow, which was capable of breaking a bone longitudinally, would much more readily cause a transverse fracture. For the same reason, M. Louis absolutely rejected the possibility of longitudinal fractures, and this sentiment has been the prevailing one up to the present day.

The following case is related by M. Levéillé, in order to shew, that longitudinal fractures are possible. Circumstances made it necessary for him to amputate the thigh of an Austrian soldier, who was put under his care in the year 1800, in consequence of being struck by a ball in the lower third of the leg at the battle of Marengo. The soldier had walked several miles, after receiving the injury, before he arrived at Pavia. The wound appeared simple, and likely to heal, as soon as the injured portion of the tibia had exfoliated. The event turned out otherwise, and the thigh was amputated.

M. Levéillé has preserved the tibia, upon which the impression of the ball may be distinguished, and, from this point, run several longitudinal and oblique lines, which extend from the lower third towards the upper head of the tibia. These are fissures, which interest the whole thickness of the parietes of the medullary canal. They have been acknowledged to be so by the professors, Dubois, Chaufrier, Duméril, Deschamps, and Roux, who were appointed by the Ecole de Médecine to enquire into the fact. (*Levéillé, Nouvelle Doctrine Chirurgicale, Tom.* 2, *p* 158.)

In a foregoing article of this dictionary, I mentioned, that in several of the cases of fractured thigh bones from gunshot violence, which were under the care of Staff-surgeon Cole and myself in Holland, the bone was split longitudinally to the extent of seven or eight inches. (See *Amputation*, *p.* 21.) The fact, however, that bullets and other balls do produce longitudinal fractures, is now universally admitted; and were there any doubt upon the subject, a specimen sent to England by my friend Mr. Cole would soon remove it. Boyer, who, a few years ago, denied the possibility of longitudinal fractures, in his late work remarks, "*On trouve néamoins, à la suite des plaies d'armes à feu, les os fendus suivant leur longueur, jusques dans leurs articulations*"—but, he is correct, when he adds, that such instances afford no proof of the possibility of a simple longitudinal fracture. (See *Traité des Maladies Chirurgicales, T.* 3, *p.* 10.)

4. *In regard to the respective position of the fragments.* These differences are highly important to be understood, because, as Boyer remarks, the treatment of fractures consists almost entirely in remedying, or preventing, the displacement of the fragments. It is not to be supposed, however, that such displacement is an absolutely essential symptom of all fractures, for it seldom exists in members composed of two bones, when only one of them is broken. Neither does it constantly happen in every fracture of the neck of a bone, as is exemplified in certain fractures of the neck of the thigh-bone, the fragments of which only change their relative situation when the patient tries to walk, or the limb is imprudently moved about. Fractures of the leg are also observed, in which there is neither a displacement of the fragments, nor an alteration in the shape of the limb, especially, when the tibia alone is fractured near its upper part, where it is very thick. When the ulna alone is broken at its upper part, there is hardly ever any displacement. The corresponding surfaces of the fragments having a large extent, cannot be separated, or can only be so with difficulty. The fibula also resists the causes, which tend to produce displacement. But, it is a symptom, which almost invariably occurs, when both bones of the leg, or forearm, are fractured together; as also in fractures of limbs, which contain only one bone, on account of the little extent of the surfaces of the fracture, and the great number of muscles, which tend to displace them.

The displacement may happen in respect to the diameter, length, direction, or circumference, of the bone.

*In respect to the diameter.* Transverse fractures are the only cases, in which this kind of displacement is observed. The two fragments may either be in contact at a part of their surfaces, or they may not be in contact at all. In the latter circumstance, the limb is shortened by the ends of the fracture slipping over each other.

*In respect to length.* This mode of displacement, in which the ends of the broken bone, ride more or less over each other, constantly occurs in oblique fractures, and in transverse ones, when the displacement, in the direction of the diameter of the bone, has been such that the surfaces of the fracture are no longer in contact. It will be hereafter explained, that whenever the limb is shortened in fractures of the extremities, it is the lower fragment which is displaced.

We may refer to the species of displacement, here spoken of, that which takes place in fractures of the patella, olecranon, and os calcis. But, with this difference, that the fragments, instead of riding over each other, separate from each other in the direction of the length of the bone, and continue separated by an interspace more or less considerable.

*In respect to the direction of the bone.* In this kind of displacement, the two fragments form an angle more or less prominent, and the bone appears arched. This displacement is principally observed in comminuted fractures. It may also happen in simple fractures, for instance, in the leg, when the limb in a straight posture does not lie upon a surface exactly horizontal, and the heel is lower than the rest of the leg. This angular projection is then anterior On the contrary, it would be posterior, if the heel were too much raised.

*In respect to the circumference of the bone.* This displacement occurs, when the lower fragment performs a rotatory movement, while the upper one continues motionless. Thus, in fractures of the neck of the femur, if the foot is badly supported by the apparatus, its weight, together with that of the limb, and the action of the muscles, inclines it outward, and turns the lower fragment in the same direction.

Besides the simple displacements, above described, there are others of a more complicated nature, which happen in several directions at once. For example, such is the displacement, which is observed in a fracture of the thigh-bone, when the lower fragment is drawn upward and inward, while the foot is turned outward.

Let us next consider the causes producing the displacement of fractures.

The bones being only passive instruments of loco-motion possess not, in their own organization, any cause of the change of situation, which takes place; but, yield to the impulse of external bodies, the weight of the member, and the action of the muscles.

The displacement may be produced by an external force, either at the moment when the fracture happens, and by the very action of the fracturing cause itself; or it may be caused by the weight of the body, when the fracture precedes the fall; or, lastly, it may be brought on by some other external force, acting on the fragments sooner or later after the occurrence of the injury.

The outward violence, which is productive of a fracture, operates sometimes directly on the situation of the breach of continuity; sometimes on parts more or less distant from this place. In both cases, the action of the force is not confined to the production of the fracture, but is partly spent in causing a displacement of the fragments.

Falls are the most usual causes of fractures. But, sometimes, the fall does not happen, till after the leg, or thigh, is actually broken. The weight of the body then produces the displacement, by pushing the upper fragment against the soft parts, which are more or less lacerated. This is what happened to Ambrose Paré. [This celebrated surgeon, being kicked by a horse, endeavoured to get out of the way; but, he instantly fell down, and the two bones of his left leg, which had been fractured, being impelled by the weight of the body, not only passed through the skin, but even through his stocking and boot. Boyer has seen a case nearly similar in a young man about twenty years of age, who while in a standing posture was struck on the middle of the thigh with the pole of a carriage, which fractured the femur. The patient fell down, and in the fall, the upper fragment was not only driven through the muscles and integuments, but also through his breeches.

The weight of the limb itself may produce displacement according to the direction, or circumference of the bone, as already detailed. The disturbance of the limb, also, in lifting the patient, and carrying him to his bed, may sometimes alter the relative situation of the fragments, and cause them to be displaced.

But, of all the causes of the displacement of fractures, the action of the muscles is the common and most powerful one. Amongst those muscles, which surround a fractured bone, some are attached to it throughout its whole length, and are equally connected with both the fragments. Others arise from the bone above, and are inserted either into that, which is articulated with the lower fragment, or into the lower fragment itself. Lastly, there are some, which come from a point more or less distant, and terminate in the upper fragment. The muscles, round the thigh-bone, furnish examples of these three arrangements. The triceps is attached to the bone its whole length. The biceps, semi-membranosus, and semi-tendinosus, come from the pelvis, and are inserted into the leg, a part, with which the lower fragment is articulated, and all the motions of which it follows. The great head of the triceps is inserted into this fragment itself. Lastly, the iliacus, psoas, pectineus, &c. come from the loins and pelvis, and are attached to the femur, not far from its upper end.

The muscles, which are attached to both fragments, contribute very little to their displacement. They may, however, draw them to the side, on which they are situated, and thus change the direction of the limb. The triceps, especially its middle portion, acts in this manner in fractures of the femur, and renders the thigh convex anteriorly. The coraco-brachialis tends to produce the same effect, when the humerus is broken below its middle.

The displacement is principally owing to such muscles as are affixed to the lower fragment or part with which this fragment is articulated. Suppose the humerus to be broken between its upper end and the insertion of the great pectoral. This muscle, aided by the latissimus dorsi and teres major, will draw the lower fragment inward, and displace it by drawing it to the inner side of the upper fragment, which remains motionless, by reason of its shortness, and because also there is nothing to excite the muscles, which are attached to it. In fractures of the neck of the thigh-bone, the upper fragment, included within the capsular ligament, affords attachment to no muscle. All those, which are affixed to the lower fragment, pull it upward and backward, in which direction the displacement is inevitable. In all fractures, the lower fragment follows every movement made by the part of the limb, with which it is articulated, and, consequently, the muscles which are attached to the bones of this last part of the limb, become a powerful cause of displacement. Thus, in a fracture of the thigh-bone, the biceps, semi-tendinosus, and semi-membranosus, draw the leg, and with it the lower fragment, upward, inward, and backward, so as to make the lower end of the fracture ascend at the inside of, and rather behind, the upper one, the extremity of which then projects forward and outward. In a fracture of the leg, the gastrocnemius, soleus, and peronei muscles, acting upon the foot, pull the lower fragments of the tibia and fibula, and draw them to the outer and posterior side of the upper fragments. For, here, as well as everywhere else, the strongest muscles, in producing the displacement, draw towards their own side the end of the fracture, on which they operate. And as the posterior muscles of the leg are far more numerous and powerful, than those on the front of the limb; while those on its outside are not antagonized by any others; the displacement must happen in the direction backward and outward. Whenever therefore a bone is fractured at a given point, an anatomical knowledge of the muscles will enable one to determine *à priori* in what direction the displacement will occur, should no means be taken to impede it, and supposing it to proceed altogether from this particular cause.

Lastly, the muscles, which are attached only to the upper fragment, may sometimes displace it. In a fracture of the thigh, situated immediately below the little trochanter, the psoas and iliacus muscles together carry forward the extremity of the upper fragment, which elevates the integuments, and forms a more or less considerable projection near the fold of the groin. But, it is to be observed, that, in general, the displacement of the upper fragment is not common, and that it is the lower one, which is drawn out of its proper position.

The manner, in which the displacement of fractures is effected by the action of muscles, explains one circumstance, which frequently attends these cases, especially fractures of the thigh, clavicle, and leg. This is a rising, or projection of the upper fragment, or that which is nearest the trunk. One might believe, at first sight, that such projection is formed by the upper fragment, which, abandoning its natural situation, rises over the lower one. But, on the least reflection, it becomes manifest, that the upper end of the fracture projects only because the lower one is displaced, and drawn towards that side on which the strongest muscles are situated. Thus, in practice, in order to make the *rising end of the bone,* (as it was termed) disappear, it is only necessary to reduce the lower fragment into its natural place. If, instead of doing this, pressure is made on the projecting part, the design fails; and if the plan be still more forcibly pursued and continued, inflammation, and, perhaps, sloughing of the integuments and other soft parts, are likely to be the unfortunate consequences.

5. *In respect to circumstances, with which fractures are accompanied.* The most important division of fractures is into *simple* and *compound.* By a *simple fracture,* surgeons mean a breach in the continuity of one, or more bones, without any external wound, communicating internally with the fracture, and caused by the protrusion of the ends of the broken bone, or bones. By a *compound fracture,* they signify the same sort of injury of a bone, or bones, attended with a laceration of the integuments, which laceration is produced by the protrusion of one, or both ends of the fracture.

The dangerous nature of compound fractures will be fully explained in the sequel of this article, and we have already adverted to the subject in speaking of *Amputation.*

Fractures are said to be *complicated,* when they are attended with diseases, or accidents, which render the indications in the treatment more numerous, and require the employment of different remedies, or the practice of sundry operations, for the accomplishment of the cure.

Thus fractures may be complicated with severe degrees of contusion, wounds of the soft parts, the injury of large blood-vessels, a dislocation, or diseases, such as the scurvy, rickets, lues venerea, &c. which are said to retard the formation of callus, and render the cure more backward.

The complication of fracture with dislocation happens but seldom, and it cannot occur, unless the luxation has taken place first, or has been produced at the same time with the fracture, and by the same cause. When once the fracture has happened, the fragments are not sufficiently within the grasp of external force, and are too moveable to admit of the bone being dislocated.

A patient with fracture may be attacked by an acute disease, which may render the treatment more troublesome, and the cure slower.

### SECTION II.

### *Causes of Fractures.*

The causes of fractures are divided into *predisposing* and *remote.*

In the first class are comprehended, the situation and functions of the bones, the age of the patients, and their diseases. Superficial bones are more easily fractured, than those which are covered by a considerable quantity of soft parts. The functions of some bones render them more liable to be fractured, than others; thus the radius, which supports the hand, is more liable to be fractured, than the ulna. The clavicle, which serves to keep the shoulder in its proper position, and support on its arched extremity all the motions of the upper extremity, is hence very subject to be broken. The gradual increase of the quantity of the phosphate of lime, in the structure of the bones, makes them brittle, in proportion as we advance in years, and, in old age, the proportion of the inorganized to the organized part is so great, that the bones are fractured by the slightest causes. In childhood, the fibrous and organized part bears a greater proportion to the earth, and the bones being, consequently, more elastic and flexible, are not so easily broken, as in old age.

Lues venerea, arthritis, cancer, rachitis, scurvy, and scrofula, says M. Levéillé, predispose to fractures. B. Bell mentions two venereal patients, of whom the hardest and largest bones were completely broken by the ordinary action of the muscles of the limb. Fabricius Hildanus quotes from Sarazin, a physician of Lyons, the case of a gouty patient, sixty years of age, who, in putting on his glove, broke his arm; the fracture having been ascertained, three days afterwards, to be situated above the elbow. Desault used often to speak of a nun of Salpêtrière, whose arm was broken, as a person was handing her out of a carriage. M. Louis, who was vexed, that no union took place, was not a little surprised to find her thigh bone experience the same fate, one day as she was changing her posture in bed. It was then that M. Louis learned, that this lady had a cancer in her right breast. M. Levéillé assures us, that he has observed similar cases in the Hôtel Dieu.

According to this last writer, the history of two girls is related by Buchner, one of whom died ricketty at the age of sixteen, having broken the femur a short time before her death; and the other, after taking the breast very well for two years, and thriving for a time, became affected with rachitis, and met with the same accident as she was merely running along in the street. (*Nouvelle Doctrine Chirurgicale, Tom.* 2, *p.* 163.)

Many extraordinary instances of fractures from a morbid softness and fragility of the bones are upon record. Suffice it here, to refer to the Philosophical Transactions; Mém. de l'Acad. Royale des Sciences; Act. Hafniens.; German Ephem.; Gooch's Chirurgical Works, Vol. 2; Saviard's Observations Chirurgicales, p. 274, &c. (See also *Fragilitas* and *Mollities Ossium*.)

On the subject of fractures, produced by the scurvy, Levéillé recommends us to peruse Marcellus Donatus; Saviard's Observations; Heyne de Morbis Ossium; Poupart's Works inserted in the Mém. de l'Acad. de Sciences, 1699; and the Treatise published at Verona, in 1761, by Jean de Bona.

Paré, Platner, Callisen, and several other writers, have set down cold, as a predisposing cause of fractures. This doctrine has originated from these injuries being more frequent in the winter time, and is quite erroneous, since, in cold countries, the greater number of falls, which happen in the winter, is a circumstance, that fully explains why fractures are then more common, than in summer.

The remote cause of fractures is external force, variously applied, in falls, blows, &c. In particular instances, the bones are broken by the violent action of the muscles attached to them; this is almost always the case with the fractured patella. The olecranon and os calcis have likewise been broken by a violent contraction of the muscles inserted into them. With respect to the heel, Petit records two instances, one of which was communicated to him by Poncelet, and the other seen by himself in Madame La Presidente de Boissire, who met with the accident in walking a gentle pace in the court of the Hôtel de Soubise. When the injury happens in leaping, or falls from a high situation, M. Levéillé thinks it more probable, that a portion of the os calcis is torn off by the powerful action of the muscles of the calf, than that it is broken by any blow immediately on the part. He states, that Desault used frequently to cite two examples of this kind, one of which is recorded in his Œuvres Chirurgicales.

Whether the long bones can be fractured by the mere action of the muscles, is yet an unsettled point. In the Philosophical Transactions, a fracture of the humerus is ascribed to this cause, and M. Botentuit has seen the same accident happen in striking a shuttle-cock with a battledore. According to M. Debeaumarchef, as a man was descending a ladder at a quick rate, his heel got entangled in an opening, and he made a violent exertion to avoid falling. The consequence was a fracture of the lower third of the leg. Curet informs us, that a cabin-boy, aged seventeen, made a considerable effort to keep himself from being thrown down by the rolling of the ship, as he was making water. The femur was fractured by the powerful action of the muscles of the thigh. The lad had no fall, and, with some difficulty, supported himself on the other limb, till he received assistance.

We are told, says M. Levéillé, by Poupée Desportes, that a negro, about twelve or thirteen years old, was seized with such violent spasmodic contractions of the muscles of the lower extremities, that the feet were turned backward, and the neck of each thigh bone was fractured, the ends of the broken bones also protruding through the skin upon the outside of the thigh. A cure was effected, after an exfoliation. We read, also, in the Melanges des Curieux de la Nature, that, during a fit of epilepsy, a child, ten years old, had its left humerus and tibia broken, and, that upon opening the body, other solutions of continuity were observed. Doctor Chamseru recollects having assisted, at his father's house, in dressing a child, eleven or twelve years old, that had broken the humerus in throwing a stone a considerable distance. (*Levéillé Nouvelle Doctrine Chirurgicale, Tom.* 2, *p.* 164—166.)

Richerand, however, positively denies, that a long bone, when healthy, can ever be broken by the mere contraction of the muscles. (*Nosogr. Chir. T.* 3, *p.* 12, *Edit.* 4.)

For my own part, making all due allowance for the inaccuracy of some of the reports made by writers, I think the possibility of the long bones being broken by the violent action of the muscles is sufficiently proved. I have never seen but one example of the occurrence; but, it was a very unequivocal one. I once attended at Pentonville, for Mr. Ramsden, an exceedingly strong man, who broke his os brachii in making a powerful blow, although he missed his aim and struck nothing at all. The whole limb was afterwards affected with vast swelling and inflammation. This man, I remember, was also visited by Mr. Welbank, of Chancery-lane.

## SECTION III.

### *Symptoms of Fractures.*

Some of the symptoms of fractures are very equivocal. The pain, and inability to move the limb, commonly enumerated, may arise from a mere bruise, a dislocation, or other cause. The crepitus; the separation and inequalities of the ends of the fracture, when the bone is superficial; the change in the form of the limb; and the shortening of it; are circumstances, communicating the most certain information; and the crepitus, in particular is the principal symptom to be depended upon. The signs of fractures, however, are so exceedingly various, according to the bones, which are the subject of injury, that, it cannot be said, that there is any one, which is invariably attendant on such cases, and characteristically confined to them. The writers of systems of surgery have usually noticed loss of motion in the injured limb, deformity, swelling, tension, pain, &c. as forming the general diagnosis of fractures. However, it is easily comprehensible by any one, acquainted with anatomy, that numerous fractures cannot prevent the motion of the part, nor occasion outward deformity; and every surgeon must know, that, though, at first, there may be pain in the situation of a fracture, no swelling and tension take place, till after a certain period.

When, therefore, a limb is broken, and the event is not manifest from the distortion of the part, it is proper to trace, with the fingers, the outlines of the suspected bone: if it be the tibia, let the surgeon examine with his fingers, whether there is any inequality along the anterior surface, and along the sharp front edge of that bone. If it be the clavicle, let him trace the superficial course of the bone, in the same attentive manner. Wherever any unusual pain occurs, or any unnatural irregularity appears, then let him try, if a grating, or crepitus, cannot be felt on endeavouring to make one end of the fracture rub against the other. When the os brachii, or the os femoris, is the subject of enquiry, a crepitus is felt almost as soon as the limb is touched, and, in the case of the broken thigh, there is a considerable shortening of the extremity, unless sometimes when the fracture is of the transverse kind. But, when there are two bones, as in the leg and the forearm, and only one is broken, the other continues to prevent the limb from being shortened, and thrown out of its natural shape, so that a crepitus can only be felt by a very careful examination with the fingers. The difficulty of the diagnosis is increased, when the surgeon is consulted late, and great swelling has come on. Where is the surgeon, says Boyer, that has not sometimes hesitated to deliver an opinion in certain cases of this description? (*Traité des Malad. Chir. T.* 3, *p.* 27.)

When the injured limb is shortened, the surgeon, before pronouncing that such change proceeds from the riding of the fragments over each other, must be sure, that the bones are not dislocated, and that the limb is not shorter, than the other naturally, or in consequence of a previous fracture that has been badly set.

In comparing the length of the lower extremities, one should place the pelvis in an horizontal position, and put the two anterior superior spines of the ossa ilium in the same line; for, if these processes are not on a level, the limb, towards which the pelvis inclines, will seem longer, than the opposite member.

The practitioner, who is well acquainted with the conformation of the limbs, and particularly with the mutual relations of the eminences of the bones to each other, will readily perceive the alterations produced by a fracture. Whenever, in consequence of a fall, or blow, a limb becomes concave at a part, where it ought to be convex; or straight, et vice versa; the change of shape and direction must proceed from a fracture with displacement. The inner edge of the great toe, when the leg rests on an horizontal surface, should correspond with the inner edge of the knee-pan. If this natural relation be altered; if the inner edge of the great toe correspond with the outer edge of the knee-pan, there can be no doubt of the existence of a fracture of both bones of the leg. (*Boyer, Traité des Maladies Chir. T.*3, *p.* 25.)

I am aware, that considerable harm, and great unnecessary pain, have been occasioned in the practice of surgery, by an over-officious care to feel the grating of fractured bones, and, whenever the case is sufficiently evident to the eyes, I cannot refrain from censuring those practitioners, who indulge their own ill-judged habits, at the expense of torture to the unfortunate patient. A fracture is an injury, that is necessarily attended with a great deal of pain, and followed by more, or less swelling, and inflammation; and to increase these evils by roughly, or unnecessarily handling the part, is both ignorantly cruel, and, if I may use the expression, unsurgical.

In some kinds of fractures, the broken bone is so surrounded with thick fleshy parts, that it is very difficult to feel a crepitus, or ascertain the existence of the injury. Some fractures of the neck of the thigh bone, unattended with much retraction of the limb, are instances illustrative of this observation.

### SECTION IV.

### *Prognosis of Fractures.*

The prognosis of fractures varies, according to the kind of bone injured, what part of it is broken, the direction of the breach of continuity, and what other mischief complicates the case. Fractures of bones, which have many strong muscles inserted into them, are more difficult of cure, than those of other bones, which have not so many powers attached to them, capable of disturbing the ends of their fractures.

The fracture of the middle part of a long bone, is less dangerous, than a similar injury near a joint, with which the bone is articulated. Fractures near joints may occasion a false anchylosis. Thus, in a fracture of the thigh-bone, near the condyles, the inflammation and swelling extend to the knee-joint, which is affected with a degree of stiffness that continues for a long while, and sometimes cannot be entirely cured during life. Besides, the inflammation of the joint is attended with more severe symptoms, in consequence of the contusion having been more violent. In a fracture near an articulation, it is to be observed, also, that the splints have no command over the short fragment, so that it is often difficult to prevent displacement. Hence, a fracture of the neck of the thigh-bone is considered a worse case, than a similar injury of the body of the bone.

When a bone is fractured in several places, the case is more serious, and the difficulty of cure much augmented. But, the accident is still worse, when a limb is fractured in two different places at once; as, for instance, the thigh and leg. Here it is almost impossible to reduce the fracture of the thigh and maintain the reduction well, so as to preserve the natural length of the limb. (See *Boyer's Traité des Maladies Chirurgicales, T.* 3, *p.* 29.)

Oblique fractures are more troublesome, and difficult of cure, than transverse ones, because an oblique surface does not resist the retraction of the lower portion of the broken bone, and consequently it is very difficult to keep the ends of the fracture applied to each other, in a proper manner.

Fractures complicated with a violent contusion of the soft parts, or with a wound, rendering them *compound*, are much more dangerous, than others free from such accidents. The bad symptoms, which render compound fractures so dangerous, are of many kinds: hemorrhage; violent and extensive inflammation of the limb, with extreme pain, delirium, and fever; large abscesses; gangrene; &c. Fractures of the leg are generally more serious than similar injuries of the upper extremity.

A fracture may be rendered a very dangerous case, by being attended with a wound of a large artery.

In a debilitated old man, a fracture is less likely to end well, than in a healthy child, or strong young subject. In extreme old age, the cure of a fracture is always more difficult, and sometimes impossible. (*Boyer, T.* 3, *p.* 32.) The scurvy certainly retards the formation of callus; but, it is not true, that pregnancy always prevents the union of fractures. Some years ago, I attended for Mr. Ramsden, a woman in a court, leading out of St. Paul's Churchyard, who broke both bones of her leg, when she was several months gone with child. Her pregnancy, however, did not appear to be at all unfavourable to the cure, as she got quite well in the usual time. "It is not generally settled," says a modern writer, "whether pregnancy should be accounted a complication. I have seen, with some other practitioners, a pregnant woman get well of a simple fracture in the ordinary time." (*Levéillé, Nouvelle Doctrine Chirurgicale, Tom.* 2, *p.* 159.) And, in another place, he says, "*Contre l'opinion de Fabrice de Hilden, l'expérience m'a prouvé que, chez les femmes grosses, le cal était aussi prompt à se former, que chez toute autre personne.*" (*Op. cit. Tom.* 2. *p.* 172.) The experience of Boyer also confirms, that pregnancy is not unfavourable to the union of fractures. (See *Traité des Mal. Chir. T.* 3, *p.* 32.)

The cases, in which fractures remain disunited, will be considered in Sect. 6 of this article on the formation of callus.

### SECTION V.

### *Treatment of Fractures in general.*

The general treatment of fractures embraces three principal indications. The first is to reduce the pieces of bone into their natural situation. The second is to secure and keep them in this state. And the third, is to prevent any unpleasant symptoms, which are likely to arise, and relieve them when they have come on.

The first indication is only applicable to cases attended with displacement; for, when the fragments are not out of their relative position, the surgeon must strictly refrain from making any attempt at reduction. His interference is then to be limited to putting up the fracture, resisting the accession of all unfavourable symptoms, and removing them, if possible, after they have taken place.

#### 1. *Of the Reduction of Fractures.*

The means employed for the reduction of fractures in general are chiefly three, viz. *extension; counter-extension;* and *coaptation,* or *setting.* But, as Boyer remarks, these means should vary according to the species of displacement; and surgical writers have generalized too much in representing them all three as necessary for the reduction of every kind of fracture. In fact, there are several cases, in which extension and counter-extension are positively useless: of this nature are fractures of the patella and olecranon, where the displacement consists of a separation of the fragments. Here the reduction may be accomplished, by putting the limb in a position, in which the muscles attached to the upper part of the bone are relaxed, and then pushing the upper fragment into contact with the lower.

Extension signifies the act of pulling the broken part in a direction from the trunk, with a view of bringing the ends of the fracture into their natural situation. By counter-extension, surgeons imply the act of making extension in the opposite direction, in order to hinder the limb, or even the whole body, from being drawn along by the extending power, which would then be unavailing.

It was formerly recommended to apply the extending force to the lower fragment, and the counter-extension to the upper one. Such practice, indeed, was advised by Mr. Pott, and is still generally preferred in this country; but upon the continent, it has been abandoned. The objections alledged against it by Boyer are: first, that it is frequently difficult and sometimes impossible, to take hold of the two fragments; as, for example, when the neck of the thigh-bone is broken. Secondly, that by applying the extension and counter-extension to the broken bone itself, most of the muscles, which surround it, are compressed, and such compression produces in these organs a spasmodic contraction, which often renders the extension and counter-extension useless, and sometimes even hurtful. (*Traité des Maladies Chir. T.* 3, *p.* 34.) The French surgeons, therefore, apply the extending force to that part of the limb, which is articulated with the lower fragment, and the counter-extension to that, which is articulated with the upper. For instance, in a fracture of the leg, the extending means act upon the foot, and the counter-extending upon the thigh; and in a fracture of the thigh, the extension is applied to the leg, while the counter-extending power fixes the pelvis.

One circumstance must here occur to the mind of the surgical reader. In this country, it is properly inculcated, that one of the first principles to be attended to in the reduction of fractures, is to put the limb in such a position as will relax the most powerful muscles connected with the broken bone; because these muscles principally impede the reduction, and disturb the ends of the fracture. But, in the French mode of making the extension and counter-extension, how can this grand principle be observed? If the extending and counter-extending means are not to be applied to the broken bone itself; but, to others, which are articulated with it, the limb must of necessity be kept in the straight posture at the time of reducing the fracture; for, were the member placed in a half bent state, the extension and counter-extension, as practised by the continental surgeons, would not be in the same line. If, therefore, it be advantageous to bend the limb at the time of reducing a fracture, the French mode of practising the extension and counter-extension must be relinquished. I am not, however, one of those surgeons, who are entirely blinded with the idea of the possibility of relaxing the whole of the muscles, connected with the broken bone, by merely bending the limb. On the contrary, I am perfectly convinced with Desault, that in general, what is gained by the relaxation of some muscles, is lost by the tension of others. But, where it is possible to relax by a certain posture the set of muscles most capable of preventing the reduction and disturbing the coaptation of a fracture, that posture I would select. Thus, in a fracture of the leg, the strong muscles of the calf undeniably possess this power, and the bent position, which relaxes them, appears to me therefore the most judicious and advantageous, not only during the reduction, but during the whole treatment of the case. In the military hospital at Cambray, I lately had under my care a fracture of the tibia and fibula, which was first treated in the straight posture. The gentlemen, who assisted me, reduced the fragments, and got them to lie tolerably well. But, every time the bandage was opened, the bones were always found displaced again. Finding that this inconvenience went on for two or three weeks, we resolved to lay the limb on its outside, in the bent position. Not the least trouble was afterwards experienced in keeping the fragments reduced. Unless, therefore, the situation of a wound, abscess, or some particular reason indicate an advantage or convenience to be derived from the straight posture, I always reduce a fractured leg in the bent position, which will be hereafter described. Here, therefore, I consider the French mode of making the extension and counter-extension as generally inadmissible.

I was also formerly of opinion, that the bent position of the limb was the best for fractured thighs; but, this sentiment has subsequently appeared to me erroneous, and it gives me pleasure to have this opportunity of declaring my entire conversion to the principles and practice adoped in these cases by Desault, and other eminent continental surgeons. The considerations, which have led me to this change, will be related in speaking of fractured thighs. If then the straight posture be advantageous in cases of broken thighs, I think it will be universally allowed, that the parts of the limb, recommended by the French surgeons for the application of the extension and counter-extension, are the most proper.

The evils and difficulties, formerly encountered in setting fractured limbs, undoubtedly proceeded in a great measure from the violent extension and counter-extension practised by our ancestors. As they were ignorant of the utility of relaxing the muscles, which displaced the ends of the broken bone, they had no means, but the employment of actual force, to effect the reduction. Since, however, the excellent instructions, contained in Mr. Pott's remarks on fractures, have received all the attention due to them, practitioners have generally been careful, in the reduction of fractures, to incapacitate the muscles as much as possible by relaxing them, and thus remove the necessity for the employment of violent extension and counter-extension.

It is difficult to lay down rules, respecting the precise degree of force, which should be used in making the extension; for, it must vary in different cases, according to the species of displacement, and the number and power of the muscles concerned in producing it. In transverse fractures, displaced only according to the diameter of the bone, a very moderate extension suffices, as it is merely practised with a view of lessening the friction of the surfaces of the fracture, which are always more or less rough. But, whatever be the direction of the fracture, when the fragments ride over each other, the extension and counter-extension must constantly be such as to remove the shortening of the limb, and overcome the force of those muscles, which, after all attention has been paid to their relaxation, still oppose the reduction. Extension, however, ought never to be practised in a violent and sudden way; but, in as gradual a manner as possible, the utmost care being taken not to shake, nor even move the limb any more, than can be avoided. When the practitioner extends a broken member all at once violently, he excites the muscles to strong spasmodic action, and there is some danger of lacerating them, because their fibres are not allowed the requisite time to yield to the force, which elongates them. The extension is to begin in the direction of the lower fragment, and be continued in that, which is natural to the body of the bone.

In every case of fracture with displacement, as soon as the necessary extension has been made, the surgeon is to endeavour to place the ends of the broken bone in their natural situation: this is termed *coaptation*, or *setting*. This operation is to be undertaken in different ways, according to the species of displacement, and the practitioner can almost always execute it by acting upon the lower fragment, without applying his fingers directly to the fracture itself, in order to regulate the contact of the extremities of the bone. When, however, it is judged necessary for this purpose to touch the broken part itself, it should be done with the utmost gentleness, so as to avoid pressing the soft parts against the points and splinters of bone.

Although the reduction of fractures may in general be accomplished with tolerable facility, it sometimes happens, that the first attempts fail. This is occasionally ascribable to the employment of too much force, and too little management, in making the extension, so that the muscles are irritated, and act so powerfully, that the design of the surgeon is completely frustrated. Here, the grand means of succeeding is putting the limb into such a position, as will relax the most powerful of the muscles, which oppose the reduction. Sometimes, however, the irritable and convulsive state of the muscles is not the effect of any wrong mode of proceeding on the part of the surgeon; but arises from the alarm, pain, and injury, caused by the accident itself. Here relaxing the muscles as much as possible is also the most likely method of removing the difficulty. In short, now that the utility of paying attention to this principle is universally known in the profession, a fracture is hardly ever met with which cannot be immediately reduced; particularly, if a copious bleeding be premised when the patient is a strong muscular subject. This evacuation, indeed, will also prove for other reasons highly beneficial, where the limb is much contused and swollen, and the tendency to inflammation is great.

### 2. *Of the Means for keeping Fractures reduced.*

After the bones have been put in their natural situation, little more than time would be necessary to complete the cure, if there were not in the muscles a continual propensity to displace the ends of the fracture again. In cases of fracture, these organs are often affected with involuntary spasmodic action, by which the broken part would certainly be displaced, were no measures taken to maintain the extremities of the broken bone in contact. Besides, the patient in easing himself, coughing, sneezing, &c. must unavoidably subject the limb to a degree of motion by which the coaptation would be altogether destroyed. Hence, the necessity of employing means for fixing the broken limb so effectually, that it may continue perfectly motionless during the whole time requisite for the union of the fracture. This second indication is sometimes troublesome and difficult, and, as Boyer observes, it is in this part of the treatment, that the surgeon has an opportunity of evincing his skill and experience. The means employed for the fulfilment of this indication are: an advantageous position; quietude; bandages; splints; and various kinds of apparatus.

In the treatment of all fractures, the position of the part, and indeed of the whole body, is a thing of material importance. Whenever the case is a fracture of the lower extremities, the patient should lie strictly in bed, until the callus is completely formed. It is likewise an advantage not to have the bed much more than a yard wide, because the surgeon and assistants can then more conveniently get at any part of the limb. Feather beds are a great deal too soft and yielding: a horsehair mattrass is far preferable. Boyer, indeed, is so impressed with the utility of letting the patient lie upon a surface, which will not sink, that he recommends two mattrasses to be used, and a board to be laid under the upper one, from the hip to beyond the patient's foot. (*Traité des Mal. Chir. p.* 39, *Vol.* 3.)

The most favourable position for a fractured limb, is that, in which all the muscles, passing over the fracture, and extending either to the lower fragment, or to that part of the limb, which is articulated with it, are equally relaxed. The injured limb should also have firm support at every point, and its position ought to be regulated so that not only this object be carefully fulfilled, but at the same time the chance of displacement from the action of the muscles, or the weight of the body, or part itself, may be diminished as much as possible.

The natural, or rather the most easy, position of the limb, is that which is usually chosen by a person who reposes himself, or who is sleeping; for then all motion is suspended, and every part assumes that posture which is most congenial to it. In this condition, the limbs are not extended, nor ever entirely bent; but only in a moderate state of flexion. Hence, Boyer remarks, that a half bent position of the limbs, is that, which is most natural, and that in which all the muscles enjoy an equal degree of relaxation, and, consequently, that it is generally speaking the best for fractures. This posture, which was recommended by Hippocrates and Galen, has (says M. Boyer) been highly extolled by Pott, who appears to have exaggerated its advantages. Considered in a general way, it is without contradiction preferable to every other position of the limb; but, its employment should be liable to exceptions, as will be noticed in treating of particular fractures. (See *Boyer's Traité des Maladies Chirurgicales, T. 3, p.* 40.)

In whatever position a broken limb is placed (says this writer) it should bear throughout its whole length, equally and perpendicularly upon the surface on which it lies, and not be only partially supported. When, for example, the extremities of a fractured limb alone rest upon the bed, the weight of the limb itself will make it bend in the situation of the fracture. The limb will also be rendered crooked, if the broken part be supported, while the extremities of the limb (especially the inferior), sink lower by their own weight. The displacement of the fracture is not the only inconvenience arising from the limb being laid upon a surface, where it is not every where equally well supported. The parts which do bear on this surface, experience a painful degree of pressure, which, if long continued, is apt to produce inflammation, and even sloughing of the integuments. Thus, in fractures of the leg, gangrene of the heel has sometimes arisen entirely from this cause. Such inconveniences may be prevented by laying a fractured limb on a surface of corresponding form; that is to say, on a surface, which is depressed where the limb has projections, and rises where it presents depressions. The surface should not be so hard as to annoy the patient, but yet it ought to be sufficiently firm not to yield to the weight of the limb and apparatus. According to Boyer, the best pillows for the support of broken limbs, are stuffed with chaff of oats, a substance, which he describes as far preferable to feathers, because it more readily admits of being pushed from the place where the limb is prominent to another situation where the member presents a depression, or hollow; and it has the advantages of being less heating than feathers, and less apt to be spoiled.

In whatever position fractured limbs are placed, they ought to be kept perfectly quiet during the whole time requisite for the union. If the broken bone be moved, while the callus is forming, the surfaces of the fracture rub against each other, and the process is disturbed; and, indeed, sometimes by repeatedly moving the limb, the consolidation of fractures is entirely prevented, or, at least, rendered very slow and difficult.

In order to maintain the limb in the right position, and in a state of quietude, and to preserve the fragments in proper contact with respect to each other, the surgeon is to caution the patient to avoid moving at all more than can be helped, and every cause likely to subject the limb to any kind of shock, or concussion, is to be removed. But, in particular, it will be necessary to apply a retentive apparatus, usually consisting of some application to the skin itself, bandages, splints, tapes, straps, and buckles, soft pads, &c. (See *Boyer's Traité des Maladies Chir. T. 3, p.* 42.)

Upon the subject of the dressings, bandages, &c. which ought to be applied to fractures, no surgeon has written better than Mr. Pott.

"The intention (says he) in applying any kind of external medicine to a broken limb is, or ought to be, to repress inflammation, to disperse extravasated blood, to keep the skin lax, moist, and perspirable, and at the same time to afford some, though very small degree of restraint or confinement to the fracture, but not to bind or press; and it should also be calculated as much as possible to prevent itching, an herpetic eruption, or an erysipelatous efflorescence. At St. Bartholomew's hospital, we use a cerate made by a solution of litharge in vinegar, which with soap, oil, and wax, is afterwards formed into such consistence as just to admit being spread without warming.

"This lies very easy, repels inflammation, is not adherent, comes off clean, and very seldom, if ever, irritates, or causes either herpes or erysipelas. But let the form and composition of the application made to the limb be what it may, one thing is clear, viz. that it should be put on in such manner, as that it may be renewed and shifted as often as may be necessary, without moving the limb in any manner: it being certain, that when once a broken thigh or leg has been properly put to rights, and has been deposited properly on the pillow, it ought not ever to be lifted up or moved from it again without necessity, until the fracture is perfectly united; and it is true, that such necessity will not very often occur. This may perhaps seem strange to those who are accustomed to roll simple fractures, and consequently to lift them up every three or four days, in order to renew such kind of bandage: but the necessity of this motion arises merely from the kind of bandage made use of, and not from any circumstance of the fracture itself. That the frequent motion of a fractured limb cannot possibly contribute to the ease of the patient, will, I suppose, be readily admitted; as I suppose also it will, that when a broken limb has been once deposited in the best position possible, it is impossible to mend that position merely by taking such limb up and laying it down again; from whence it must follow, that such kind of apparatus as necessitates the surgeon frequently to disturb the limb, cannot be so good as one that does not; provided the latter will accomplish the same kind of cure as the former: the truth of which position will appear in the most satisfactory manner to any, who will take a view of the method, in which simple fractures are treated at the before-mentioned hospital. Such application having been made as the surgeon thinks right, the next thing to be done is to put on a proper bandage.—That used by the ancients, and by the majority of the present practitioners, is what is commonly called a roller. This is of different length, according to the surgeon's choice, or as it may be used in the form of one, two, or more pieces. Hippocrates used three; (see *Fab. ab Aquapendente*, *Wiseman*, *Scultetus*, *Hildanus*, *Petit*, *Duverney;*) Celsus six; but the present people seldom use more than one. By such kind of bandage three intentions are aimed at, and said to be accomplished, viz. to confine the fracture, to repress or prevent a flux of humours, and to regulate the callus, (see *Duverney:*) but whoever will reflect seriously on this matter, will soon be convinced, that although some sort of bandage is necessary in every simple fracture, as well for preserving some degree of steadiness to the limb, as for the retention of the applications, yet none, nor either of these three ends can be answered merely, or even principally, by bandage of any kind whatever: and therefore, if this should be found to be true, that is, if it should appear, that whatever kind of deligation be made use of, it cannot be a principal, but only an accessory kind of assistance, and that in a small degree, and very little to be depended upon, it will follow that such kind of bandage as is most difficult to be applied with justness and exactitude, such as is soonest relaxed and out of order, such as stands most frequently in need of renewal, and, in such renewal, is most likely to give pain and trouble, must be more improper and less eligible, than one which is more easily applied, less liable to be out of order, and which can be adjusted without moving the limb, &c.

"The best and most useful bandage for a simple fracture of the leg or thigh, is what is commonly known by the name of the eighteen-tailed bandage, or rather one made on the same principle, but with a little difference in the disposition of the pieces. The common method is to make it so, that the parts which are to surround the limb make a right angle with that which runs lengthways under it; instead of which, if they are tacked on so as to make an acute angle, they will fold over each other in an oblique direction, and thereby sit more neatly and more securely, as the parts will thereby have more connexion with and more dependence on each other. In compound fractures, as they are called, every body sees and acknowledges the utility of this kind of bandage preferably to the roller, and for very obvious and convincing reasons, but particularly because it does not become necessary to lift up and disturb the limb every time it is dressed, or every time the bandage loosens.

"The pain attending motion in a compound fracture, the circumstance of the wound, and the greater degree of instability of parts thereby produced, are certainly very good reasons for dressing such wound with a bandage, which does not render motion necessary; but I should be glad to know what can make it necessary, or right, or eligible, to move a limb in the case of simple fracture? what benefit can be proposed by it? what utility can be drawn from it? When a broken bone has been well set, and the limb well placed, what possible advantage can arise from moving it? surely none; but, on the contrary, pain and probable mischief. Is it not the one great intention, to procure unition? Can moving the limb every two or three days contribute to such intention? must it not, on the contrary, obstruct and retard it? Is not perfect quietude as necessary toward the union of the bone, in a simple as in a compound fracture? It is true, that in the one there is a wound which requires to be dressed, and the motion of the limb may in general be attended with rather more pain than in the other; but does motion in the simple fracture give ease, or procure more expeditious union?

"Every benefit then which can be supposed to be obtained from the use of the common bandage or roller, is equally attainable from the use of that which I have just mentioned, with one additional, and to the patient, most invaluable advantage, viz. that of never finding it necessary to have his leg or thigh once, during the cure, removed from the pillow on which it has been properly deposited. In short, to quit reasoning and speak to fact, it is the constant practice at St. Bartholomew's, and attended with all possible success. We always use the eighteen-tailed bandage; and never move the limb to renew or adjust it." (*Pott's Remarks on Fractures, &c.*)

In France, an universal preference is given to Scultetus's bandage in every instance, where we employ the eighteen-tailed one, from which it chiefly differs in being composed of separate pieces admitting of removal, so that when a part of the bandage is soiled, it can be taken away, without disturbing the whole of the dressings. The clean pieces are drawn under the part by first stitching them to those, which are about to be removed. In cases of compound fracture, where the bandage is soiled with the discharge in a very short time, and must be often removed, certainly, Scultetus's bandage is the best, particularly, as it possesses all the recommendations peculiar to that of the eighteen-tailed kind. (See *Boyer's Traité des Mal. Chir. T.* 3, *p.* 46.)

With respect to the general objects and uses of bandages in cases of fracture, I ought to notice one design of them, which is strongly inculcated in the modern French schools; namely, that of "benumbing the irritability of the muscles" by the compression resulting from their regular and even application to the whole of the member. In describing the treatment of particular fractures, I shall have occasion to advert to the examples, in which a moderate general compression of the muscles may be attended with utility.

"The parts of the general apparatus for a simple fracture, which come next in order, (observes Mr. Pott) are the splints;" which are unquestionably the most efficient of all the applications made to a broken limb, with a view of keeping the ends of the fracture steady and in a proper state of contact. Without them, the surgeon would in vain endeavour to maintain the reduction.

"Splints," says Pott, "are generally made of paste-board, wood, or some resisting kind of stuff, and are ordered to be applied lengthways on the broken limb; in some cases three, in others four; for the more steady and quiet detention of the fracture.

"That splints, properly made and judiciously applied, are very serviceable, is beyond all doubt, but their utility depends much on their size, and the manner in which they are applied.

"The true and proper use of splints is, to preserve steadiness in the whole limb, without compressing the fracture at all. By the former they become very assistant to the curative intention; by the latter they are very capable of causing pain and other inconveniences; at the same time that they cannot, in the nature of things, contribute to the steadiness of the limb.

"In order to be of any real use at all, splints should, in the case of a broken leg, reach above the knee, and below the ankle; should be only two in number, and should be so guarded with tow, rag, or cotton, that they should press only on the joints, and not at all on the fracture.

"By this they become really serviceable; but a short splint, which extends only a little above and a little below the fracture, and does not take in the two joints, is an absurdity, and, what is worse, it is a mischievous absurdity.

"By pressing on both joints, they keep not only them, but the foot steady; by pressing on the fracture only, they cannot retain it in its place, if the foot be in the smallest degree displaced; but they may, and frequently do, occasion mischief, by rudely pressing the parts covering the fracture against the edges and inequalities of it.

"I suppose it will be said, that although short splints do not of themselves sustain and keep steady the two joints, and consequently the limb, yet that purpose in the broken leg may be and is fulfilled by junks, fanons, and other contrivances: to which I answer, that then the short splints are in that case of no use at all, and had better be laid aside; they should be used for no other purpose, but that of keeping the limb steady; and if they do not answer that end, they are an incumbrance, and multiply the articles in the apparatus for a fractured leg, very unnecessarily.

"In the case of a fractured os femoris, if the limb be laid in an extended posture, one splint should certainly reach from the hip to the outer ankle, and another (somewhat shorter) should extend from the groin to the inner ankle. In the case of a broken tibia and fibula, there never can be occasion for more than two splints, one of which should extend from above the knee to below the ankle on one side, and the other splint should do the same on the other side." (See *Remarks on Fractures and Dislocations, in Pott's Chirurgical Works, Vol.* 1, *p.* 298, *&c. Edit.* 1808.) Further observations on splints will be found in a subsequent part of the dictionary. See *Splint.*

In oblique fractures of the thigh, and sometimes even in those of the leg, the difficulty of accomplishing by the ordinary means a cure free from deformity, especially a shortening of the limb, has led to the idea of employing continual extension. This expression implies the operation of a bandage, or machine, which continually draws the fragments of the broken bone in contrary directions, at the same time that it restrains them from gliding over each other, and maintains them in contact during the whole time necessary for their union. In England, this practice has long been relinquished. It appears to have been chased away by the dazzling theory of relaxing every muscle in such manner as to render it incapable of displacing an oblique fracture; a theory, with which the surgeons of this country were but too much blinded by the persuasive eloquence of the late Mr. Pott. On the continent, however, the eminent Desault saw at once every inconsistency in the doctrine of relaxing the muscles, so as to incapacitate entirely the whole set connected with a broken thigh; and he never ceased to inculcate in his school, that, in such cases, the assistance of the mechanical apparatus applied to the limb was the main thing, by which the shortening of the limb was to be prevented. When we consider the treatment of fractured thighs, we shall find, that the best apparatus for these cases partly produces its good effect by continual, though moderate extension. Perhaps, also, these are the only instances, in which an advantageous position will not generally do away all occasion for this method, to which many surgeons appear to entertain strong, but highly exaggerated, objections.

By means of continual extension, (observes Boyer) we not only succeed in uniting the fracture, while the limb preserves its natural length; but, we afford the part a steadiness, which is singularly favourable to the formation of the callus.

In order to derive from continual extension the utmost benefit, and render the method as little painful as possible, so as to be supportable during the whole time of treatment, the machines and bandages, according to Boyer should be constructed and applied conformably to the following rules.

1. *We should avoid compressing the muscles, which pass over the situation of the fracture, and the elongation of which organs is necessary to restore to the limb the length, which it has lost by the gliding of the fragments over each other.*

With this view, the extending power ought to be applied to that part of the limb, which is articulated with the lower head of the fractured bone; and the counter-extending force to that, which is articulated with the upper head. If these powers were applied to the broken bone itself, the muscles passing over the fracture would suffer such compression, as would excite spasm, and render the continual extension ineffectual and even hurtful.

2. *The extending and counter-extending force ought to be divided upon as large surfaces as possible.*

The reason of this rule is obvious. The pressure of external bodies on parts is less painful, in proportion as the surface pressed upon is extensive, and the operation supported at once by numerous points. On this principle, a narrow band creates stronger and more painful pressure, than a broad one; and hence, the rollers, and other pieces of the apparatus for making the extension and counter-extension, should be as wide as possible.

3. *The powers, making continual extension, should act according to the direction of the axis of the broken bone.*

4. *The continual extension should be practised in as slow, gradual, and insensible a manner as possible.*

The muscles easily yield to a force, which stretches them, when such force acts slowly, and is very gradually increased, according to the shortness of the limb, and the power of the muscles producing the displacement. But, if one were all on a sudden to begin with making violent extension, the rough forced elongation of the muscles would excite such a spasmodic action of them, as would frustrate every attempt to restore the natural length of the limb. And, if in order to fulfil this purpose, the extending force were increased in a ratio to the resistance of the muscles, there would be danger of lacerating these organs, because their fibres would not have time enough to yield.

5. Lastly; *the parts, upon which the extending and counter-extending force acts, should be defended: and the compression, made by the tapes, or other pieces of the bandage and apparatus, ought to be equalized.*

These indications may be fulfilled by covering the parts, on which the tapes and bandages press, with tow or wool-pads; and by filling up all the depressions of the limb with the same soft substances, so as to give it a circular form. The bandage will then not hurt the most projecting parts, on which they would make a strong and injurious degree of pressure, if the depressions were not artificially filled up.

By observing these rules, says Boyer, continual extension may always be borne, even by the most delicate and irritable patients; and the important advantage will be obtained of curing the fracture, with the proper length of the limb preserved. (*Traité des Maladies Chirurgicales,* T. 3, p. 56—59.)

### 3. *Means for preventing and removing the unfavourable Symptoms liable to arise from Fractures.*

After having reduced the fracture; applied a suitable apparatus for keeping it so; and put the part in an advantageous position; the practitioner is to attend to the third indication in the treatment, viz. the prevention and removal of any unfavourable symptoms.

With the exception of a few simple fractures of the upper extremity, it is proper in all cases to allow for the first few days only very low diet, broths, tea, &c. When the patient is young, and strong, and the swelling and inflammation threaten to be considerable, venesection should be practised. In other circumstances, it may in general be dispensed with, because it is well known, that for the quick formation of the callus, by which the fracture is to be united, strength and a vigorous circulation are highly favourable. The patient may be permitted to drink as often, and as much as he likes, of any cooling acid beverage. A very low diet is only to be continued the first few days, unless great inflammation arise; for, experience proves, that the method, when too much prolonged, has bad effects, and tends, on the same principle as bleeding, to retard the union of the fracture.

Costiveness is to be averted by the use of clysters, and mild aperient medicines. It must be confessed, that, in fractures of the lower extremity, the disturbance of the limb caused by the patient's being obliged to move himself, after taking a purgative, is seriously objectionable; but, perhaps, in all, and certainly in some habits, a neglect to open the bowels soon after the accident, would have still more pernicious consequences. With the assistance of a bed-pan, the patient will also be enabled to ease himself, with as little disturbance of the broken limb as possible.

With respect to external applications, we should carefully avoid using all such plasters and ointments as irritate the skin, or create a disagreeable itching; for they sometimes bring on erysipelas. The emplastrum saponis in common use is the best for all simple fractures, and it is the best, rather because it does no harm, than because it does any essential good. It is, generally speaking, a good plan for the first few days to wet the bandages with cold water. The tendency to inflammation and swelling may in this way be considerably lessened. The surgeon, however, should recollect, that the bandage shrinks when wetted, and may become so tight as to do harm, if not attended to. Solutions of the acetite of lead, and other salts, make the bandages stiff and hard; and as they are perhaps not more efficacious, than cold water alone, the latter is preferable in cases of fracture.

When a fracture is well set, the position of the part right, and the bandage and splints neither too tight, nor too slack, the less the broken bone is moved, and the less the apparatus and dressings are disturbed, the better. Sometimes, however, the practitioner is obliged to take off the splints, and undo the bandage, in order to ascertain, that the ends of the fracture lie in even contact. Were he to leave the splints on the part ten days, or a fortnight, without ever being sure of this important point, he might find, when too late for alteration, that the fracture was in a state of displacement, and the limb seriously deformed. Hence, a strong reason for employing the eighteen-tailed bandage, which admits of being opened, without disturbing the limb, or even without lifting it from the surface, upon which it has been deposited.

In fractures of the lower extremities, particularly of the legs, it sometimes happens, the first two or three nights after the reduction, that the limb is affected with convulsive spasms and cramps, which make the patient start out of his sleep, and displace the ends of the bone, which must be again reduced.

When the callus has acquired some firmness, the patient should still keep the part, or limb perfectly quiet, until the union is perfectly consolidated. And, in fractures of the lower extremity, even after the union has proceeded so far, that the splints admit of being left off, the patient ought not to venture to get out of bed, or bear upon the limb till several more days have elapsed.

All fractures, however simple and well treated they may be, are constantly followed by weakness and stiffness of the limb. These unpleasant consequences are the greater, the more violently the limb has been contused, the nearer the fracture is to a joint, and the longer the part has remained motionless, and without exercise. The stiffness always affects the inferior joint of the broken bone, much more than the superior. For the relief of these effects of fractures, it is customary t employ friction, liniments, emollient relaxing applications, cold washes and bathing; but, sometimes, notwithstanding such remedies, the member does not quickly recover its strength, but continues stiff and weak for a year, or even a longer time. The most effectual plans for the prevention of this state should therefore be resorted to early. These consist in making the joints, nearest the fracture, execute slight motions, as soon as the union is sufficiently advanced, not to be in danger of interruption from this practice. A great deal of caution, however, is necessary in moving the part, and it is safer for the surgeon to superintend the business himself, than leave it to the patient, or others. One of the best proceedings also for the hindrance of much weakness and stiffness in the limb after a fracture, is to discontinue the splints and tight bandages, immediately the state of the callus will allow. The manner, in which their pressure retards the circulation, and prevents the action of the muscles, is one of the principal causes of the stiffness of the limb, and, consequently, the sooner they can be safely left off, the sooner will the patient regain the free use of the limb.

In France, the chief division of fractures is into *simple* and *complicated*, which last includes amongst many varieties the cases, which we name *compound*. We shall here briefly notice a few of the complications, and the particular treatment which they require.

Fractures (says Boyer) are always attended with a certain degree of contusion, which is constantly more severe in cases where the violence has acted directly on the situation of the fracture. But, such contusion can only be regarded as a complication of the accident, when it exists in so violent a degree as to demand a different treatment from that which is employed in simple fractures.

In this circumstance, the splints and bandage should be applied rather slackly, and the latter ought to be wet with cold water, or some resolvent lotion. The patient is to be bled more or less freely, according to his age, state of his constitution, and violence of the contusion. The next day, the splints and bandage should be opened; a thing highly necessary to be observed; for, where it has been neglected, the limb has been known to mortify, in consequence of the swelling having rendered the bandage too tight, so that the circulation was impeded. (*Boyer Traité des Maladies Chirurg. T.* 3, *p.* 63—64.)

In cases where the contusion is very great, but unattended with a wound of the integuments, the tension and swelling may be so intense, that the cuticle is detached, forming vesicles filled with yellowish serum. These vesicles may deceive an inexperienced surgeon, and lead him to imagine that the limb is threatened, or actually affected with gangrene. They ought to be punctured, and covered with pledgets of simple ointment. Here some practitioners apply emollient poultices under the apparatus; but, there is some inconvenience in their use, and it may be questioned, whether cold lotions are not generally better.

In simple fractures, it does not often happen, that a large artery is wounded; but, when the injury does occur, and a diffused aneurism takes place, the surgeon is to expose the vessel by an incision, and apply a ligature above and below the opening. We are to be careful, however, before resorting to the operation, that the tumour is not a venous extravasation, which may almost always be dissipated by resolvent applications.

Fractures are sometimes complicated with a dislocation. Here, if possible, the luxation should invariably be reduced before the fracture is set. The possibility of reducing the dislocation (says Boyer) depends upon the species of articulation, the situation of the fracture, and other circumstances of the case. When it is a ginglymoid joint, when the ligaments are lacerated, and the swelling is not considerable, the luxation may be reduced easily enough; but, when it is an orbicular joint, surrounded by numerous muscles; and when the fracture is near the articulation, and situated below the dislocation; the reduction of the latter is impossible. The attempt indeed would be injurious, because the necessary extension could not act upon the upper fragment, and were it to operate upon the lower, it could only have the effect of painfully stretching the muscles, and perhaps lacerating them. The fracture, therefore, should be first attended to, and after its firm union, an endeavour may be made to rectify the dislocation. Boyer conceives, that there will be more probability of success, when care has been taken to move the limb gently as soon as the state of the callus would permit it. He also recommends the employment of emollient relaxing applications. He confesses, however, that the attempt rarely succeeds after the perfect union of the fracture. There are, it is true, examples, in which old dislocations may be reduced; but, these are cases, which are not complicated with a fracture, an accident, which always renders the muscles and ligaments so stiff, that they cannot yield to the extension requisite for the reduction. "I do not know, (says Boyer,) that a luxation, complicated with fracture, has ever been reduced, when the nature of the joint, and the accidental circumstances of the case, prevented the treatment from beginning with the reduction of the dislocation." (*Traité des Maladies Chirurg. Tom.* 3, *p.* 79.)

### *Compound Fractures.*

We shall now introduce the valuable observations of Mr. Pott on the subject of compound fractures. What he has said upon these cases is, (with one exception, to which I have adverted in a note, or two) the essence of good surgery, not in the least deteriorated, as a few other parts of his precepts have been, by the more mature instructions of time and experience, or by that growing state of surgical science, which, fostered by genius and observation, is continually bringing to light new facts, before which the old prevailing errors of the day happily disappear.

"I use the term compound fracture, (says Mr. Pott) in the sense in which the English have always used it; that is, to imply a broken bone complicated with a wound.

"In this kind of case the first object of consideration is, whether the preservation of the fractured limb can, with safety to the patient's life, be attempted; or, in other words, whether the probable chance of destruction, from the nature and circumstances of the accident, is not greater than it would be from the operation of amputation. Many things may occur to make this the case. The bone, or bones, being broken into many different pieces, and that for a considerable extent, as happens from broad wheels, or other heavy bodies of large surface, passing over, or falling on such limbs; the skin, muscles, tendons, &c. being so torn, lacerated, and destroyed, as to render gangrene and mortification the most probable and most immediate consequence; the extremities of the bones forming a joint being crushed, or as it were comminuted, and the ligaments connecting such bones being torn and spoiled, are, among others, sufficient reasons for proposing and for performing immediate amputation. Reasons, which (notwithstanding any thing that may have been said to the contrary) long and reiterated experience has approved, and which are vindicable upon every principle of humanity, or chirurgic knowledge.

"When a surgeon says, that a limb, which has just suffered a particular kind of compound fracture, ought rather to be immediately cut off, than that any attempt should be made for its preservation, he does not mean by so saying, that it is absolutely impossible for such limb to be preserved at all events; he is not to be supposed to mean so much in general, though sometimes even that will be obvious; all that he can truly and justly mean is, that from the experience of time it has been found, that the attempts to preserve limbs so circumstanced, have most frequently been frustrated by the death of the patients, in consequence of such injury; and that from the same experience it has been found, that the chance of death from amputation is by no means equal to that arising from such kind of fracture.

"Every man knows, that apparently desperate cases are sometimes cured; and that limbs so shattered and wounded, as to render amputation the only *probable* means for the preservation of life, are now and then saved. This is an uncontroverted fact, but a fact which proves very little against the common opinion; because every man of experience also knows, that such escapes are very rare, much too rare to admit of being made precedents, and that the majority of such attempts fail.

"This consideration relative to amputation is of the more importance, because it most frequently requires immediate determination; every minute of delay is, in many instances, to the patient's disadvantage; and a very short space of time indeed, frequently makes all the difference between probable safety and fatality. If these cases in general would admit of deliberation for two or three days, and during that time such circumstances might be expected to arise, as ought necessarily to determine the surgeon in his conduct, without adding to the patient's hazard, the difference would be considerable; the former would not seem to be so precipitate in his determination, as he is frequently thought to be; and the latter, being more convinced of the necessity, would submit to it with less reluctance. But unhappily for both parties, this is seldom the case; and the first opportunity having been neglected or not embraced, we are frequently denied another. Here therefore the whole exertion of a man's judgment is required, that he may neither rashly and unnecessarily deprive his patient of a limb, nor through a false tenderness and timidity, suffer him to perish, by endeavouring to preserve such limb. Some degree of address is also necessary upon such occasion, in order to convince the patient, that what seems to be determined upon hastily and with precipitation, will not safely admit of longer deliberation.

"The limb being thought capable of preservation, the next consideration is the reduction of the fracture. The ease or difficulty attending this, depends not only on the general nature of the case, but on the particular disposition of the bone with regard to the wound.

"If the bone be not protruded forth, the trouble of reducing and of placing the fracture in a good position, will be much less than if the case be otherwise: and in the case of protrusion or thrusting forth of the bone or bones, the difficulty is always in proportion to the comparative size of the wound, through which such bone has passed. In a compound fracture of the leg or thigh, it is always the upper part of the broken bone which is thrust forth. If the fracture be of the transverse kind, and the wound large, a moderate degree of extension will in general easily reduce it; but if the fracture be oblique, and terminates, as it often does, in a long sharp point, this point very often makes its way through a wound no larger than just to permit such extension. In this case, the very placing the leg in a straight position, in order to make extension, obliges the wound or orifice to gird the bone tight, and makes all that part of it, which is out of such wound, press hard on the skin of the leg underneath it. In these circumstances, all attempts for reduction in this manner will be found to be impracticable; the more the leg is stretched out, the tighter the bone will be begirt by the wound, and the more it will press on the skin underneath.

"Upon this occasion, it is not very unusual to have recourse to the saw, and by that means to remove a portion of the protruded bone.

"I will not say that this is always or absolutely unnecessary or wrong, but it most certainly is frequently so. In some few instances, and in the case of extreme sharp-pointedness of the extremity of the bone, it may be, and undoubtedly is right: but, in many instances, it is totally unnecessary.

"The two most proper means of overcoming this difficulty are, change of posture of the limb, and enlargement of the wound. In many cases the former of these, under proper conduct, will be found fully sufficient; and where it fails, the latter should always be made use of. Whoever will attend to the effect, which putting the leg or thigh (having a compound fracture and protruded bone) into a straight position always produces; that is, to the manner in which the wound in such position girds the bone, and to the increased difficulty of reduction thereby induced, and will then, by changing the posture of such limb from an extended one, to one moderately bent, observe the alteration thereby made, in both the just-mentioned circumstances, will be satisfied of the truth of what I have said, and of the much greater degree of ease and practicability of reduction in the bent, than in the extended position; that is, in the relaxed, than in the stretched state of the muscles. Reduction being found impracticable, either by extension or change of posture, the obvious and necessary remedy for this difficulty is enlargement of the wound. This to some practitioners, who have not seen much of this business, appears a disagreeable circumstance, and therefore they endeavour to avoid it; but their apprehensions are in general groundless and ill founded: in enlarging the wound there is neither difficulty nor danger, it is the skin only which can require division, and in making such wound there can be no possible hazard. It is needless to say that the division should be such as to render reduction easy; or to remind the practitioner, that such enlarged opening may serve very good future purposes, by making way for the extraction of fragments, and the discharge of matter, sloughs, &c.

" If the bone be broken into several pieces, and any of them be either totally separated, so as to lie loose in the wound, or if they be so loosened and detached, as to render their union highly improbable, all such pieces ought to be taken away; but they should be removed with all possible gentleness, without pain, violence, or laceration, without the risk of hemorrhage, and with as little poking into the wound as possible. If the extremities of the bone be broken into sharp points, which points wound and irritate the surrounding parts, they must be removed also. But the whole of this part of the treatment of a compound fracture should be executed with great caution; and the practitioner should remember, that if the parts surrounding the fracture be violated, that is, be torn, irritated, and so disturbed as to excite great pain, high inflammation, &c. it is exactly the same thing to the patient, and to the event of the case, whether such violence be the necessary consequence of the fracture, or of his unnecessary, and awkward manner of poking into, and disturbing the wound. The great objects of fear and apprehension in a compound fracture, (that is, in the first or early state of it) are, pain, irritation, and inflammation; these are to be avoided, prevented, and appeased by all possible means, let every thing else be as it may; and although certain things are always recited, as necessary to be done, such as removal of fragments of bone, of foreign bodies, &c. &c. &c. yet it is always to be understood, that such acts may be performed without prejudicial or great violence, and without adding at all to the risk or hazard necessarily incurred by the disease.

" Reduction of, or setting a compound fracture, is the same as in the simple; that is, the intention in both is the same, viz. by means of a proper degree of extension to obtain as apt a position of the ends of the fracture, with regard to each other, as the nature of the case will admit, and thereby to produce as perfect and as speedy union as possible.

" To repeat in this place what has already been said under the head of Extension would be tedious and unnecessary. If the arguments there used for making extension, with the limb so moderately bent as to relax the muscles, and take off their power of resistance, have any force at all, they must have much more when applied to the present case: if it be allowed to be found very painful to extend, or to put or keep on the stretch, muscles which are not at all or but slightly wounded, and only liable in such extension to be pricked and irritated, it is self-evident that it must be much more so when the same parts are torn and wounded considerably: when the ends of the fractured bone have made their way quite through them, divided the skin, and laid all open to the access of the air.

" Every consequence, which does, or may be supposed to flow from wound, pain, or irritation, in consequence of violence must necessarily be much greater, when a lacerated wound, and that made by the bone, is added to the fracture; not to mention the ills arising from extending or stretching out muscles already torn or half divided.

" One moment's reflection must be sufficient to convince any reasonable man: but experience is the only proper test of all these kinds of things. Let this method of treatment, then, be fairly and properly subjected to it; and if the great advantage of the one over the other does not appear, that is, if the less sensation of pain by the patient, and the more happy, more perfect, and more expeditious accomplishment of his purpose by the surgeon, do not determine greatly in favour of relaxed position, I am, and have for a considerable length of time, been greatly mistaken.

" The wound dilated, (if necessary) loose pieces removed, (if there were any) and the fracture reduced, and placed in the best possible position, the next thing to be done is to apply a dressing.

"On this subject a great deal has been said by writers, particularly by such of them as have implicit faith in external applications; but, in order to be able to execute this part of the process properly, a man has only to ask himself, What are the intentions which, by any kind of dressing to a compound fracture, he means to aim at the accomplishment of? And a rational answer to this will give him all that he can want to know.

"The dressing necessary in a compound fracture is of two kinds, viz. that for the wound, and that for the limb. By the former, we mean to maintain a proper opening for the easy and free discharge of gleet, sloughs, matter, extraneous bodies, or fragments of bone, and this in such manner, and by such means, as shall give the least possible pain or fatigue, shall neither irritate by its qualities, nor oppress by its quantity, nor by any means contribute to the detention or lodgment of what ought to be discharged. By the latter, our aim should be the prevention or removal of inflammation, in order, if the habit be good, and all other circumstances fortunate, that the wound may be healed, by what the surgeons call the first intention, that is, without suppuration or abscess; or, that not being practicable, that gangrene and mortification, or even very large suppuration may be prevented, and such a moderate and kindly degree of it established as may best serve the purpose of a cure. The first therefore, or the dressing for the wound, can consist of nothing better, or indeed so good, as soft dry lint, laid on so lightly as just to absorb the sanies, but neither to distend the wound, or be the smallest impediment or obstruction to the discharge of matter. This lint should be kept clear of the edges, and the whole of it should be covered with a pledget spread with a soft easy digestive. The times of dressing must be determined by the nature of the case; if the discharge be small or moderate, once in twenty-four hours will be sufficient; but if it be large, more frequent dressing will be necessary, as well to prevent offence, as to remedy the inconveniences arising from a great discharge of an irritating sharp sanies.

"The method of treating the limb, with a view to the prevention of such accidents and symptoms, as pain, inflammation, and laceration of parts, are likely to produce, is different with different practitioners; some using from the very first, relaxing, greasy applications; others applying medicines of very different nature. Both these may be right conditionally, that is, according to different circumstances in the case, but they cannot be equally so in the same circumstances.

"Many practitioners are accustomed to envelope compound fractures in a soft, warm, relaxing cataplasm from the very first: whether the limb be in a tense swollen state, or not. This, if I may take the liberty of saying so, appears to me to be injudicious. When from neglect, from length of time passed without assistance, from misconduct or drunkenness in the patient, from awkwardness and unhandiness in the assistants, or from any other cause, a tension has taken possession of the limb, and it is become tumid, swollen, and painful, a warm cataplasm is certainly the best and most proper application that can be made, and that for very obvious reasons; the state of the parts under these circumstances is such, that immediate union is impossible, and nothing but a free and plentiful suppuration can dissipate or remove impending mischief: every thing therefore which can tend toward relaxing the tense, swollen, and irritable state of the parts concerned, must necessarily be right; the one thing aimed at, (plentiful suppuration) cannot be accomplished without it. But when the parts are not in this state, the intention seems to be very different. To relax swollen parts, and to appease pain and irritation by such relaxation, is one thing; to prevent inflammatory defluxion and tumefaction, is certainly another; and they ought to be aimed at by very different means. In the former, a large suppuration is a necessary circumstance of relief, and the great means of cure; in the latter it is not, and a very moderate degree of it is all that is required. The warm cataplasm therefore, although it be the best application that can be made use of in the one case, is certainly not so proper in the other, as applications of a more discutient kind, such as mixtures of spirit. vini, vinegar and water, with crude sal ammoniac, spirit. mindereri, acet. litharg. and medicines of this class, in whatever form the surgeon may choose. By these, in good habits, in fortunately circumstanced cases, and with the assistance of what should never be neglected, (I mean phlebotomy* and the general antiphlogistic regimen,) inflammation may sometimes be kept off, and a cure accomplished, without large collections or discharges of matter, or that considerable degree of suppuration, which, though necessary in some cases, and almost unavoidable in others, are and must be rather promoted and encouraged, than retarded, or prevented, by warm relaxing applications of the poultice kind.

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* Bleeding is now not frequently practised, except on very plethoric persons, and out of large cities.

"Compound fractures in general require to be dressed every day; and the wounded parts not admitting the smallest degree of motion without great pain, perfect quietude becomes as necessary as frequent dressing.

"The common bandage therefore (the roller) has always in this case been laid aside, and what is called the eighteen-tailed bandage substituted, very judiciously, in its place. Of this I have already spoken so largely, as to make repetition unnecessary.

"Splints, that is, such short ones as are most commonly made use of in simple fractures, are by all forbid in the compound, and that for the same reason which ought to have prevented them from having ever been used in the former, viz. because the probable good to be derived from them can be but little; and the probable mischief is obvious and considerable.

"But although short splints are for many reasons palpably improper, in both cases, yet those of proper length, those which reach from joint to joint, comprehend them both, and are applied on each side of the leg only, are very useful both in the simple and in the compound fracture, as they may, thus applied, be made to keep the limb more constantly steady and quiet, than it can be kept without them.

"With regard to position of the limb, I have already been so explicit, when speaking of the simple fracture, that to say any thing more about it here would be an abuse of the reader's time and patience. The only, or the material difference between a simple and a compound fracture, as far as relates to this part of the treatment, is, that as the parts surrounding the broken bone in the latter are more injured, and consequently more liable to irritation, pain, inflammation, and all their consequences, therefore every method and means, by which the alleviation of such symptoms, and the prevention of such consequences can be obtained, is still more necessary and requisite. Among these, the posture of the limb is so principal a circumstance, that without its concurrence every other will be fruitless. The points to be aimed at are, the even position of the broken parts of the bone, and such disposition of the muscles surrounding them, as is most suitable to their wounded, lacerated state, as shall be least likely to irritate them, by keeping them on the stretch, or to produce high inflammation, and at best large suppuration. These, I say, are the ends to be pursued; and how much the position of the limb does, and must necessarily contribute to the advantage, or disadvantage just recited, must be so obvious to any body capable of reflection, that nothing more need be said about it.

"Every body knows, or ought to know that these cases, of all others, require at first the most rigid observance of the antiphlogistic regimen; that pain is to be appeased, and rest obtained, by anodynes; that inflammation is to be prevented or removed, by free and frequent bleeding, by keeping the body open, and by the administration of such medicines as are best known to serve such purposes.—And that, during the first state or stage, the treatment of the limb must be calculated, either for the prevention of inflammatory tumefaction, by such applications as are in general known by the title of discutients; or, such tumour and tension having already taken possession of the limb, that warm fomentation, and relaxing and emollient medicines are required.

"If these, according to the particular exigence of the case, prove successful, the consequence is, either a quiet easy wound, which suppurates very moderately, and gives little or no trouble; or a wound, attended at first with considerable inflammation, and that producing large suppuration, with great discharge, and troublesome formation and lodgment of matter. If, on the other hand, our attempts do not succeed, the consequence is gangrene and mortification.

"These are the three general events or terminations of a compound fracture, and according to these must the surgeon's conduct be regulated.

"In the first instance, he has indeed nothing to do but to avoid doing mischief, either by his manner of dressing, or by disturbing the limb. Nature, let alone, will accomplish her own purpose; and art has little more to do than to preserve the due position of the limb, and to take care, that the dressing applied to the wound proves no impediment.

"In the second stage, that of formation and lodgment of matter, in consequence of large suppuration, all a surgeon's judgment will sometimes be required in the treatment both of the patient and his injured limb. Enlargement of the present wound, for the more convenient discharge of matter*; new or counter-openings for the same purpose, or for the extraction of fragments of broken or exfoliated bone, will very frequently be found necessary, and must be executed. In the doing this, care must be taken, that what is requisite be done, and no more; and that such requisite operations be performed with as little disturbance and pain as possible; the manner of doing business of this kind, will make a very material difference in the sufferings of the patient.

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* "It is a practice with some, from a timidity in using a knife, to make use of bolsters and plaster-compresses for the discharge of lodging-matter. Where another, or a counter-opening can conveniently and safely be made, it is always preferable, the compress sometimes acting diametrically opposite to the intention with which it is applied, and contributing to the lodgment by confining the matter; beside which, it requires a greater degree

"Very contrary, or at least very different intentions, seem to me to require the surgeon's very particular attention in the two parts of this stage of the disease.

"Previous to large suppuration, or considerable collections and lodgments of matter, tumefaction, induration, and high inflammation, attended with pain, irritation, and fever, require evacuation by phlebotomy, an open belly, and antiphlogistic remedies, as well as the free use of anodynes, and such applications to the limb as may most serve the purpose of relaxation. But the matter having been formed and let out, and the pain, fever, &c. which were symptomatic thereof, having disappeared, or ceased, the use and purpose of such medicines and such applications cease also, and they ought therefore to be discontinued. By evacuation, &c. the patient's strength has necessarily (and indeed properly) been reduced; by cataplasm, &c. the parts have been so relaxed as to procure an abatement or cessation of inflammation, a subsidence of tumefaction, and the establishment of a free suppuration; but these ends once fairly and fully answered, another intention arises, which regards the safety and well-doing of the patient, nearly, if not full as much as the former; which intention will be necessarily frustrated by pursuing the method hitherto followed. The patient now will require refection and support, as much as he before stood in need of reduction; and the limb, whose indurated and inflamed state hitherto required the emollient and relaxing poultice, will now be hurt by such kind of application, and stand in need of such as are endued with contrary qualities, or, at least, such as shall not continue to relax. Good, light, easily digested nutriment, and the Peruvian bark, will best answer the purpose of internals; the discontinuation of the cataplasms, and the application of medicines of the corroborating kind, are as necessary with regard to externals*.

"In short, if there be any rationale in the use of the cataplasm in the first stage, its impropriety in the second, must be evident from the same principles. So also with regard to evacuation and the antiphlogistic regimen, when all the good proposed to be obtained by them has been received, a pursuit of the same method must become injurious, and that for the same reason why it was before necessary and beneficial.

"A non-attention to this has, I believe, been not infrequently the cause of the loss both of limbs and lives.

"Every body who is acquainted with surgery knows, that in the case of bad compound fracture, attended with large suppuration, it sometimes happens, even under the best and most judicious treatment, that the discharge becomes too great for the patient to sustain; and that, after all the fatigue, pain, and discipline, which he has undergone, it becomes necessary to compound for life by the loss of the limb.† This, I say, does sometimes happen under the best and most rational treatment; but I am convinced that it also is now and then the consequence of pursuing the reducing, the antiphlogistic, and the relaxing plan too far. I would therefore take the liberty seriously to advise the young practitioner, to attend diligently to his patient's pulse and general state, as well as to that of his fractured limb and wound; and when he finds all febrile complaint at an end, and all inflammatory tumour and hardness gone, and his patient is rather languid than feverish, that his pulse is rather weak and low than hard and full, that his appetite begins to fail, and that he is inclined to sweat, or purge, without assignable cause, and this

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of pressure to make it efficacious, than a limb in such circumstances generally can bear.

* "It is surprising how large and how disagreeable a discharge will be made for a considerable length of time, in some instances, from the detention and irritation of a splinter of bone. If therefore such discharge be made, and there be neither sinus nor lodgment to account for it, and all other circumstances are favourable, examination should always be made, in order to know whether such cause does not exist, and if it does, it must be gently and carefully removed."

† "There is one circumstance relative to compound fractures, which perhaps may be deemed worth noticing; which is, that I do not remember ever to have seen it necessary to amputate a limb for a compound fracture, on account of the too great discharge, in which the fracture had been united. In all those cases, where the operation has been found necessary on account of the drain, the fracture has always been perfectly loose and disunited." (*Pott.*)

in consequence of a large discharge of matter from a limb which has suffered great inflammation, but which is now become rather soft and flabby, than hard and tumid; that he will in such circumstances set about the support of his patient, and the strengthening of the diseased limb *totis viribus;* in which I am from experience satisfied, he may often be successful, where it may not be generally expected that he would. At least, he will have the satisfaction of having made a rational attempt; and if he is obliged at last to have recourse to amputation, he will perform it, and his patient will submit to it, with less reluctance, than if no such trial had been made.

"I have said, that a compound fracture either unites and heals, as it were, by the first intention, which is the case of some of the lucky few (and was my own*); or it is attended with high inflammation, multiplied abscesses, and large suppuration, demanding all a surgeon's attention and skill, and even then sometimes ending in the loss of limb, or life, or both; or, that all our attempts prove fruitless from the first, and gangrene and mortification are the inevitable consequence of the accident.

"The two first I have already spoken to, the last only remains.

"Gangrene and mortification are sometimes the inevitable consequences of the mischief done to the limb at the time that the bone is broken; or they are the consequences of the laceration of parts made by the mere protrusion of the said bone.

"They are also sometimes the effect of improper or negligent treatment; of great violence used in making extension; of irritation of the wounded parts, by poking after, or in removing fragments or splinters of bone; of painful dressings; of improper disposition of the limb, and of the neglect of phlebotomy, anodynes, evacuation, &c. Any, or all these, are capable either of inducing such a state of inflammation as shall end in a gangrene, or of permitting the inflammation, necessarily attendant upon such accident, to terminate in the same event.

"When such accident, or such disease, is the mere consequence of the injury done to the limb, either at the time of, or by the fracture, it generally makes its appearance very early; in which case also, its progress is generally too rapid for art to check. For these reasons, when the mischief seems to be of such nature as that gangrene and mortification are most likely to ensue, no time can be spared, and the impending mischief must either be submitted to or prevented by early amputation. I have already said, that a very few hours make all the difference between probable safety and destruction. If we wait till the disease has taken possession of the limb, even in the smallest degree, the operation will serve no purpose, but that of accelerating the patient's death. If we wait for an apparent alteration in the part, we shall have waited until all opportunity of being really serviceable is past. The disease takes possession of the cellular membrane surrounding the large blood-vessels and nerves, some time before it makes any appearance in the integuments; and will always be found to extend much higher in the former part, than its appearance in the latter seems to indicate. I have more than once seen the experiment made of amputating, after a gangrene has been begun, but I never saw it succeed; it has always hastened the patient's destruction †.

"As far therefore as my experience will enable me to judge, or as I may from thence be permitted to dictate, I would advise that such attempt should never be made; but, the first opportunity having been neglected, or not embraced, all the power of the chirurgic art is to be employed in assisting nature to separate the diseased part from the sound; an attempt which now and then, under particular circumstances, has proved successful, but which is so rarely so, as not to be much depended upon.

"If the parts are so bruised and torn, that the circulation through them is rendered impracticable, or if the gangrene is the immediate effect of such mischief, the consequence of omitting amputation, and of attempting to save the limb is, as I have already observed, most frequently very early destruction: but, if the gangrenous mischief be not merely and immediately the effect of the wounded state of the parts, but of high inflammation, badness of general habit, improper disposition of the limb, &c. it is sometimes in our power so to alleviate, correct, and alter these causes, as to obtain a truce with the disease, and a separation of the unsound parts from the sound. The means whereby to accomplish this end must, in the nature of things, be varied according to the producing causes or circumstances: the sanguine and bilious must be lowered and emptied; the weak and debilitated must be assisted by such medicines as will add force to the *vis vitæ;* and errors in the treatment of the wound or fracture must be corrected; but it is evident to common sense, that for these there is no possibility of prescribing any other than very general rules indeed. The nature and circumstances of each individual case must determine the practitioner's conduct.

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* Mr. Pott suffered a compound fracture of his own leg.

† In the article *Gunshot Wounds,* however, the reader will find, that there is a species of gangrene, arising from external violence, and totally unconnected with constitutional causes, where the surgeon should deviate from the common rule of deferring amputation, until the mortification has ceased to spread. A memoir "*Sur la Gangrène Traumatique,*" by M. Larrey, which was published a few years ago, contains the most decisive facts in regard to the propriety of such practice. (See his *Mém. de Chir. Militaire,* *T.* 2.) And the experience of Mr. Lawrence tends also to confirm the truth of M. Larrey's Observations. (See *Medico-Chirurg. Trans. Vol.* 6, *p.* 184, *&c.*)

"In general, inflammation will require phlebotomy and an open belly, together with the neutral antiphlogistic medicines; pain and irritation will stand in need of anodynes, and the Peruvian bark, joined in some cases, and at some times, with those of the cooling kind, at others with the cordial, will be found necessary and useful. So also tension and induration will point out the use of fomentation and warm relaxing cataplasms, and the most soft and lenient treatment and dressing. But there are two parts of the treatment of this kind of case mentioned by the generality of writers, which I cannot think of as they seem to have done. One is, the use of stimulating antiseptic applications to the wound; the other is, what is commonly called scarification of the limb. Let it be remarked, that I speak of both these, as prescribed and practised while the gangrene is forming, as it were, and the parts are by no means mortified. While the inflammatory tension subsists, alleviation of pain, and relaxation of the wounded and swollen parts, in order to obtain a suppuration, and consequently a separation, seem to constitute the intention, which ought to be pursued upon the most rational principles: warm irritating tinctures of myrrh, aloes, and euphorbium; mixtures of tinct. myrrh. with mel. Ægyptiac. and such kind of medicines, which are found to be frequently ordered, and indeed are frequently used, particularly in compound fractures produced by gun-shot, seem to me to be very opposite to such intention, and very little likely to produce or to contribute to the one thing which ought to be aimed at, I mean the establishment of a kindly suppuration. I know what is said, in answer to this, viz. that such kind of stimulus assists nature in throwing off the diseased parts; but this is a kind of language, which I believe will be found upon examination to have been first used without any sufficient or good ground, and to have been echoed ever since upon trust. It had its foundation in the opinion that gun-shot wounds were poisonous, and that the mortification in them was the effect of fire; and it has been continued ever since, to the great detriment of many a sufferer. A gun-shot wound, whether with or without fracture, is a wound accompanied with the highest degree of contusion, and with some degree of laceration; and every greatly contused and lacerated wound requires the same kind of treatment which a gun-shot wound does, as far as regards the soft parts. The intention in both ought to be to appease pain, irritation, and inflammation; to relax the indurated, and to unload the swollen parts; and by such means to procure a kindly suppuration; the consequence of which must be, a separation of the diseased parts from the sound. Now, whether this is likely to be best and soonest accomplished by such dressings and such applications as heat and stimulate, and render the parts to which they are applied crisp and rigid, may fairly be left to common sense to determine.

"Scarification, in the manner, and at the time, in which it is generally ordered and performed, has never appeared to me to have served any one good purpose. When the parts are really mortified, incisions made of sufficient depth will give discharge to a quantity of acrid and offensive ichor; will let out the confined air, which is the effect of putrefaction; and thereby will contribute to unloading the whole limb; and they will also make way for the application of proper dressings. But while a gangrene is impending, that is, while the parts are in the highest state of inflammation, what the benefit can be which is supposed or expected to proceed from scratching the surface of the skin with a lancet, I never could imagine; nor, though I have often seen it practised, do I remember ever to have seen any real benefit from it. If the skin be still sound, and of quick sensation, the scratching it in this superficial manner is painful, and adds to the inflamed state of it; if it be not sound, but quite altered, such superficial incision can do no possible service; both the sanies and the imprisoned air, are beneath the membrana adiposa; and merely scratching the skin in the superficial manner, in which it is generally done, will not reach to, or discharge either.

"From what has been said, it will appear, that there are three points of time, or three stages, of a bad compound fracture, in which amputation of the limb may be necessary and right; and these three points of time are so limited, that a good deal of the hazard or safety of the operation depends on the observance or nonobservance of them.

"The first is immediately after the accident, before inflammation has taken possession of the parts. If this opportunity be neglected or not embraced, the consequence is either a gangrene or a large suppuration, with formation and lodgment of matter. If the former of these be the case, the operation ought never to be thought of, till there is a perfect and absolute separation of the mortified parts*. If the latter, no man can possibly propose the removal of a limb, until it be found, by sufficient trial, that there is no prospect of obtaining a cure without; and that, by not performing the operation, the patient's strength and life will be exhausted by the discharge. When this becomes the hazard, the sooner amputation is performed the better. In the first instance, the operation ought to take place before inflammatory mischief is incurred; in the second, we are to wait for a kind of crisis of such inflammation; in the third, the proportional strength and state of the patient, compared with the discharge and state of the fracture, must form our determination." (*Pott's Remarks on Fractures.*)

## SECTION VI.

### *Of the Formation of Callus, the Consolidation of Fractures, and of the Cases in which they remain without Union.*

In the treatment of fractures, the whole business of the surgeon consists in putting the displaced extremities of the bone into their natural situation again; in keeping them in this situation by means of a suitable apparatus; in endeavouring to avert unfavourable symptoms, and in adopting measures for their removal, when they have actually occurred. The consolidation of a broken bone is (strictly speaking) the work of nature, and is effected by a process, to which a state of perfect health is above all things propitious.

This consolidation of a broken bone, which is analogous to the union of wounds of the soft parts, is termed the *formation of the callus*, and the new uniting bony substance itself is named *callus*.

I shall continue to follow the arrangement of Boyer, and first speak of the time requisite for the formation of the callus, and of the circumstances, which promote, or retard it, or even impede it altogether. We shall then consider the local circumstances, which are necessary or favourable to the union of fractures; afterwards the different opinions of authors on this process of nature; and finally, the conduct to be pursued at the ordinary period of the completion of the process; the formation of false joints; and the resources of surgery in such cases.

### 1. *Of the Time requisite for the Formation of the Callus, and of General Circumstances, which favour, or retard it, or even completely prevent it.*

Surgical writers have been absurdly anxious to specify a determinate space of time, which should be allowed for the formation of the callus, as if this process always went on in different cases with the same uninterrupted regularity. Forty days were often fixed upon as necessary for the purpose. This prejudice is not only false, but dangerous, inasmuch as patients have been thereby induced to suppose themselves cured, before they were so in reality, and have consequently moved about too boldly, and thus run the risk of occasioning deformity, or a new fracture. As Boyer observes, it is impossible to determine precisely, and in a general way, the period requisite for the cure, because it differs according to a variety of circumstances. All we know is, that the callus is usually formed between the twentieth and seventieth day, sooner, or later, according to the age and constitution of the patient, the thickness of the bone, the weight which it has to support, the state of the patient's health, &c.

1. *Age.* Fractures are consolidated (*cæteris paribus*) with more ease and quickness in young subjects, than in adults, or old persons. In general also the callus forms more speedily in proportion as the individual approaches to infancy. In two children, whose arms had been broken in difficult labours, De la Motte saw the humerus united in twelve days, by a very simple apparatus. In fact, at this period of life, every part has a tendency to grow and develope itself, and the vitality of the bones is more active, their vascularity greater, their gelatinous substance more abundant. On the contrary, in advanced age, the parts have lost all disposition to developement, the vascularity of the bones is in a great measure obliterated, and (to use the expression of Boyer) their vitality is annihilated under the mass of phosphate of lime, which accumulates in them.

It has been asserted, that, in early infancy, the callus is generally produced in excess, and may cause deformity by its redundance. But, experience does not confirm the truth of this statement. The real cause of the deformity of the callus always proceeds from the fracture either being badly set, or not kept properly reduced, or else from the part being moved about before the callus has acquired a due degree of firmness.

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* Compound fractures are cases of external violence. Now as the mortification proceeds from the injury, and may not be connected with any internal cause, it is an example of what M. Larrey calls the "*Gangrène Traumatique*," and the surgeon ought not to be governed by the old maxim of delaying amputation, until the spreading of the mortification has ceased. Were the patient of a sound constitution, and not too far gone, I should not fear to imitate M. Larrey, and would amputate, though the mortification were actually in a spreading state.

2. *Constitution.* A fracture is united much sooner, in a strong healthy person, than a weak unhealthy subject. Sometimes, the consolidation is prevented by some inexplicable unknown cause, nothing wrong being remarkable either in the constitution, or the part. Ruysch and Van Swieten have seen several cases of this kind, in which the patients were apparently quite healthy and judiciously treated.

3. *Thickness of the Bone, and weight which it has to support.* The bones are thicker and larger, in proportion as they have a greater weight to bear, and as the muscles inserted into them are more powerful. It is observed, *cæteris paribus,* that the larger the bones are, the longer is the time requisite for their union. Thus, a broken thigh-bone is longer in growing together again, than a fractured tibia; the tibia longer than the humerus, the bones of the forearm, clavicle, ribs, &c.

As the callus remains a good while softer, than the rest of the bone, it follows, that if the newly united bone has to bear all the weight of the body in walking, the patient should defer this exercise longer. Hence one reason, why fractures of the arm are sooner cured than those of the tibia, and why six or seven weeks at least are necessary in the treatment of a broken thigh-bone, which of itself has to support in progression all the weight of the trunk.

4. *State of Health.* Fractures unite with more quickness and facility, when the patient enjoys good health. The scurvy has a manifest and powerful effect in retarding the consolidation of fractures, and even in causing the absorption of the callus several years after a bone has been broken and cured, so that it becomes flexible again. In Lord Anson's Voyage, this phenomenon is particularly recorded. (*See p.* 142, *Edit.* 15 *in* 8*vo.*) Cancer, lues venerea, and rickets, are also stated by surgical writers to obstruct and sometimes hinder altogether the formation of callus.

Fabricius Hildanus has cited two cases, which tend to prove, that the union of fractures is retarded by pregnancy. I believe, the opinion originated from what this writer has related. But, from the facts mentioned in a preceding page of this article, there can now be no doubt, that pregnancy does not usually prevent the formation of the callus in the ordinary time. Mr. Wardrop, however, says that many instances have been observed of bones being fractured during pregnancy, and never shewing any disposition to unite till after delivery. (*Medico-Chirurgical Trans. Vol.* 5, *p.* 359.) But, as this statement remains unsupported by any new cases, I infer, that it is founded on the old doctrine of Fabricius Hildanus. It is not to be supposed, however, that I mean to imply any thing more, than that fractures commonly do well in pregnant women; for, it would be absurd to imagine, that there may not be now and then a solitary instance, in which from bad health, or some other cause, a fracture will not speedily unite in a pregnant female.

Besides the remarks, made here and in a foregoing page on the causes preventing the union of fractures, a few additional observations on the same subject will be introduced in the sequel of this article, when we speak of the modes of attempting the cure of old disunited fractures.

### 2. *Of some local Circumstances necessary for the Consolidation of Fractures.*

As Boyer has well explained, three local circumstances are necessary to obtain a firm callus, without deformity. 1. The two fragments must be possessed of vitality. 2. The surfaces of the fracture must correspond. 3. They must be kept in a completely motionless state.

*The two fragments must be possessed of vitality.* If one of them should be too scantily supplied with blood, the fracture would be incapable of union. This (says Boyer) is what happens in certain fractures of the neck of the femur, where the head of this bone is entirely detached, and the ligamentous substance, which is reflected over its neck and serves as its periosteum, is totally lacerated, as well as the vessels, which ramify upon it. Hence, the upper fragment lodged in the cotyloid cavity no longer receives from the vessels, sent to it through the ligamentum teres, a sufficiency of blood for the process of the formation of callus. This is especially likely to be the case, when the patient is far advanced in years, and the vessels considerably lessened in diameter. A certain degree of life must therefore exist in both portions of bone; for without it the attempt at union will fail.

*The surfaces of the fracture must correspond exactly.* This circumstance is not absolutely necessary for the consolidation of the fracture; but without it, the formation of the callus is always slow and difficult. For instance, in a transverse fracture of the thigh-bone, the fragments after being displaced according the thickness of the bone, may undergo a second displacement according to its length, by passing beyond each other. The surfaces of the fracture are then not at all in contact, and the portions of bone only touch each other by their sides, which being covered by the periosteum can unite but difficultly. Here, at the end of the second month, the union will frequently have made but little progress; nor can the cure be accomplished without deformity and shortening of the limb.

*The fragments must be retained in a completely motionless state.* This condition is so essential to the formation of callus, that if the ends of a fracture were daily moved, they could not unite. The two extremities of the bone would then heal separately, just like the sides of a wound which have not been put into contact. The ends of a fracture, however, which cicatrize separately, do not (according to Boyer) always become smooth, nor is there ordinarily any capsular ligament formed. (*Traité des Mal. Chir. T.* 3, *p.* 86.)

### 3. *Different Opinions on the Formation of Callus.*

There is perhaps no subject, (observes Boyer) that has excited more discussion, than the formation of callus. The ancients ascribed it to the extravasation of a gelatinous fluid, which was called the osseous juice, and which becoming hard, served to unite the ends of the broken bone, just as glue serves to unite two pieces of wood. Hence, in order to favor the production of callus, they were in the habit of recommending their patients to eat abundantly of every sort of viscid farinaceous aliment, the glutinous parts of animals, and especially osteocolla, of which Fabricius Hildanus relates miracles.

But, if these accounts were true, callus must be inorganic; or else one would be compelled to admit, that the inspissation of an inorganic fluid was capable of producing an organized substance: which is an absurdity. Besides, observation demonstrates, that callus is an organized matter, like the substance of the bone itself, which it resembles, and that, when subjected to anatomical and chemical experiments, it exhibits all the appearances of the proper substance of bones.

According to Duhamel, callus is formed by the periosteum which he regards likewise as the organ of ossification. When a bone is fractured, (says this naturalist) the periosteum of the two fragments first grows together, and then swells, and forms a circular rising round the fracture. The thickened membrane is converted into a gelatinous substance, which soon becomes a cartilaginous matter. In this vessels develope themselves, and different points of ossification commence, which multiply and unite. Thus, when every part of the periosteum near the fracture is hardened and ossified, this membrane is changed, as it were, into a sort of clasp, which extends over the two fragments, and holds them together.

It was objected to Duhamel's theory, that, if a bone be slit longitudinally in the situation of a former fracture, the fragments are observed to have their substances blended completely together, and not simply to lie in contact in the manner of two pieces of wood placed end to end, and kept in contact by means of a clasp. Duhamel, with a view of obviating this difficulty, supposed that the periosteum elongated itself from the circumference towards the centre of the bone, and that such continuation of this membrane underwent the same changes, as that portion which was contiguous to the fracture, and thus served to unite the ends of the fragments, between which it was interposed. He admits, also, in some cases, that the internal periosteum, or medullary membrane, may furnish productions extending between the ends of the fracture, like the continuation of the external periosteum, with which they become connected. Lastly; he supposed, that, in young subjects, whose bones had not acquired their full degree of hardness, that the cartilaginous part was capable of extension, and that in cases of fracture, it contributed to the more perfect union of the fragments.

The system of Duhamel was opposed by Haller and Dethleef, who, after a long series of well performed experiments, came to the conclusion, that the sentiment of the ancients ought to be adopted again. In short, they admitted, with the latter, that the callus was formed by a gelatinous juice, which exudes from the extremity of the fractured bone, particularly from the medullary texture, and is effused all about the fracture; that such juice is organized, forms a cartilage, and at length ossifies.

But, as Boyer justly remarks, whatever difference there may seem to be betwixt this doctrine, and that of Duhamel, it is merely in the mode of explaining the facts. All these observers noticed the same phenomena; and all the experiments of Dethleef accorded perfectly well with those of Duhamel. Both found, during the first days, immediately after the fracture, a lymph extravasated between the fragments, and a small tumor in the situation of the fracture. Both also remarked, that this tumour became softer, and that it afterwards formed a gelatinous, then a cartilaginous, and lastly a bony, substance, which composed the uniting medium. But, Duhamel contends, that the cartilage is produced by the periosteum, while Haller and Dethleef argue, that it is the production of the extravasated lymph.

Professor Boyer thinks, that Duhamel imputes too much to the periosteum; but, that Haller and Dethleef were also wrong, if they supposed, as M. Fougeroux alleges, that an unorganized lymph could produce an organized substance by inspissation. (See *Le Second Mémoire sur les Os, par M. Bordenave, recueilli et publié Par M. Fougeroux, p,* 124.) It appears to Boyer much more natural to believe, that the gelatinous lymph already contains the rudiments of organization, which will become visible as they are developed; just as it is usually believed, that the rudiments of all our organs are contained in the transparent mucilage, of which the embryo seems to consist.

The experiments of Duhamel and Dethleef were carefully repeated by Bordenave, who ascertained several new and interesting facts. The result was the same in regard to the phenomena observed; but the explanation of them was different. (See the *Memoir above mentioned.*)

Instead of attributing the formation of callus to the periosteum, like Duhamel; or to the extravasation of lymph, like Dethleef; Bordenave conceived, that broken bones united again by a process analogous to that, which nature employs for the union of the divided soft parts. His inference is principally founded on two facts generally admitted; 1st, that there is in the bones a vascular texture, designed to maintain the circulation in them; 2dly, that such texture dilates when fractures are uniting, as appears from the swelling in the situation of the fracture, without which swelling, there could be no union. Bordenave further remarks, with Haller and Dethleef; 1st, That callus, at the commencement of its formation, appears to consist of a glutinous fluid effused from the ruptured vessels. 2dly, That this substance afterwards assumes the form of cartilage, to which certain vessels are distributed, which deposit the bony matter, and thus begin the generation of callus. 3rdly, That the particles of bone, being all joined together, the callus changes into a porous substance, which in time becomes solid and compact, like the substance of bones.

Doubtless (says Boyer) we shall always remain ignorant of the process, which nature employs for the union of the bones, as well as for that of the soft parts. Every theory, which shall be invented on this point, can only be conjectures more or less probable. However, if this author were to adopt any system exclusively, he expresses that he should prefer that of Bordenave.

The mechanism of nature, in the formation of callus, must be analogous to that which she adopts in the union of wounds. The principal difference seems to be, that in the union of a fracture, the vessels after a time deposit the phosphate of lime. The vessels of the periosteum, medullary membrane, and probably also of the soft parts in the immediate vicinity of the fracture, first effuse coagulating lymph. This gradually becomes vascular, and in proportion as the vessels acquire the power of secreting earthy matter, it is by degrees converted into new bone, termed *callus*, which from being at first soft and flexible, at length becomes firm and unyielding, and fit for constituting the future bond of union between the two extremities of the fracture.

The periosteum and medullary membrane contribute materially to the formation of callus; but, as Boyer observes, it is not at all probable, that fleshy granulations arise from the surface of the fragments. Such granulations only make their appearance upon bones, which are denuded, and never without suppuration. Besides, says he, these granulations have never been seen in experiments upon animals, nor in the dissections of the human subject in different stages of fractures. See *Callus.*

Whatever may be the process, by which callus is formed, it is during the first two or three weeks after the fracture, that the fragments undergo the changes, which promote their reunion. But, it is between the twentieth and thirtieth, and especially between the thirtieth and fiftieth days, that nature labours effectually in consolidating the callus. Hence, at this period, our care to retain the ends of the fracture in exact contact and perfectly at rest should be redoubled; for, though there are a few instances, in which deformity really proceeds from irregular ossifications, it is almost always a fact, that the deformity originates from the fracture being disturbed and not kept properly reduced. (See *Boyer's Traité des Maladies Chirurgicales, T. 3, p. 86, &c.)*

### 4. *Of the Conduct to be adopted at the ordinary Period of the Consolidation of Fractures; and of the Treatment of False Joints.*

When the requisite time for a broken bone to become firmly united has elapsed, it is proper to examine carefully and cautiously the place of the fracture, in order to learn whether the callus has acquired a suitable degree of strength. If the bone should be found to bend in the least at the injured part, the callus is not sufficiently strong, and the limb should be immediately put up in the apparatus again, with a view of preventing a new fracture, or, at all events, deformity.

For the same reason, the patient should not be allowed to make use of his limb, immediately the fracture has united. In fractures of the lower extremity, he ought to use crutches, and only let the weight of the trunk by degrees bear upon the injured limb. From neglect of this precaution, the callus has been known to be absorbed, the limb to be shortened, and the patient become a cripple. An accidental slip may also produce the fracture again; for, notwithstanding the assertion of writers, the callus, so far from being firmer than the rest of the bone, is not so strong till after a certain time. (*Boyer, T. 3. p. 93.*)

If, when the necessary time for the completion of the union has expired, the callus is not yet firm, we must examine; 1st, The relative position of the fragments, and the consistence of the callus. 2dly, The causes, which may have retarded its consolidation.

There are certain indescribable constitutions, in which bones, more particularly, however, the os brachii, will not unite again after being broken. These temperaments are also very various; at least, I infer so from two subjects, to whom I paid particular attention. One was a strong, robust man, whose chief peculiarity seemed to be his indifference to pain: he had the ends of the broken os brachii cut down to, turned out, and sawn off, by Mr. Long, in St. Bartholomew's hospital, and the limb was afterwards put in splints, and taken the greatest care of; but no union followed. The other case was a broken tibia and fibula, which remained disunited for about four months; but, afterwards, grew together. The latter subject was a complete instance of hypochondriasis. I have since seen a woman, under Sir James Earle, in the above situation, whose os brachii did not unite in the least, though it had been broken several months. Every attempt to move the bone occasioned excruciating torture. The woman died of some illness in the hospital, and, on dissecting the arm, the cause of the fracture not having united was found to arise from the upper, sharp, pointed extremity of the lower portion of the broken bone having been forcibly drawn up by the muscles, and penetrated the substance of the biceps, in which it still remained. I am indebted to Mr. Henry Earle for the account of the appearance on dissection, and I do not know, that this kind of impediment to the union of a fracture has been noticed by any writer, except Mr. Charles White, who appears to have conceived the possibility of the occurrence. (*Cases in Surgery, p.* 70. *Edit.* 1770.)

The causes of fractures remaining disunited, will, according to Richerand, be found to depend, either upon the broken ends of the bone not beng properly in contact; upon the limb having been moved too much; upon the advanced age of the patient; or, upon the general inertia of the solids, and languor of the vital properties. (*Nosographie Chirurgicale, Tom.* 3, *p.* 37. *Edit.* 2.)

It is observed by M. Larrey, that the gunshot wounds of the extremities, complicated with fracture, especially with that of the humerus, received by the soldiers of the French army in Syria, were almost all followed by the formation of accidental joints. The two fragments of the broken bone continued moveable, their asperities and projecting angles having been destroyed by friction, and their ends being rounded and covered with a cartilaginous substance, so as to facilitate the motions, which the patients executed in various directions, in an imperfect manner, and without pain. M. Larrey acquaints us, that many invalids were sent back to France with such infirmity.

"I ascribe," says he, "the causes of these accidental articulations:

"1. To the continual motion, to which the wounded soldiers were exposed, after their departure from Syria, till their arrival in Egypt, in consequence of their having been obliged either to walk this journey on foot, or to be carried it on beasts.

"2. To the bad quality of the food, and the brackish water, which the men were under the necessity of drinking in this painful journey.

"3. To the quality of the atmosphere of Syria, almost entirely destitute of vital air, and impregnated with pernicious gases, issuing from the numerous marshes, near which, we were a long while stationed.

"All these causes may have prevented the formation of callus, either by diminishing the quantity of the phosphate of lime, or moving the bones out of that state of coaptation, in which they should constantly lie, in order to unite.

"Bandages, embrocations, rest, and regimen, proved quite ineffectual."—(*Larrey, Mémoires de Chirurgie Militaire, Tom.* 2, *p.* 131, 132.)

The false, or preternatural articulations, which occur in cases of fracture without union, have been generally supposed to resemble common joints. According to Boyer, however, this opinion is incorrect. The ends of the fracture, which are sometimes rounded, and sometimes pointed, are connected together by a cellular and ligamentous substance. But, their surfaces are not covered by a smooth cartilaginous matter, nor is there constantly a capsular ligament. "I am convinced of this fact, by the dissection of several ununited fractures, the fragments of which are preserved in my museum." (*Boyer, T.* 3, *p.* 94.) And, in another place, the same Professor, speaking of these false joints, remarks: "I repeat that I have never found in their structure, any thing, which could be compared with an articulation; neither capsular ligament, nor smooth cartilaginous surfaces. On the contrary, I have invariably found, in the false joints of the thigh-bone and humerus, which I have had opportunities of dissecting, a fibrous ligamentous substance extending from one fragment to the other, and it is very probable, that, with some modifications, it is the same with all the other cases, which I have not seen.

"It is possible, however, that, in the fore-arm, the ends of the fracture may assume a structure, which bears a greater resemblance to an articulation. This is what happened in an example, which was communicated to M. Bayle by M. Silvestre, in the Republique des Lettres, Juillet 1685, p. 718, &c. Another similar case is also recorded by Fabricius Hildanus, Obs. 91. Centur. 3." (See *Boyer's Traité des Maladies Chir. T.* 3, *p.* 101—103.)

In the Hunterian Collection may likewise be seen a false joint in the bones of the fore-arm, where the resemblance to a natural articulation was greater, than what Boyer has seen in other situations. A false joint in the arm, or fore-arm, does not absolutely prevent the motion of the limb, which may yet be of considerable use; but, when the disease is in the thigh, or leg, the member cannot support the weight of the body, and the patient cannot walk without crutches.'

The diversity of the causes, which may be concerned in preventing the union of fractures, plainly shews, that the treatment should also be different in different cases.

When the want of union is ascribable to the ends of the fracture not being in a state of coaptation, and to their having been moved about too frequently, the obvious indications are, to set the fracture better, and to take adequate measures for keeping its extremities in contact and perfectly motionless.

If the union has been prevented by a portion of muscle or other soft part, getting between the ends of the bone, the only means of affording a chance of union, would be cutting through the integuments, removing the displaced soft parts, and placing the ends of the bone in contact. (*Wardrop in Medico-Chir. Trans. Vol.* 5, *p.* 360.)

When the advanced age of the patient seems to be the cause of the union not taking place, the application of the proper apparatus is to be continued a considerable time, since experience proves, that, in old subjects, the cure of fractures often requires many months. In such examples, also, tonic and cordial medicines, with a nutritive diet, are highly proper.

When several months have elapsed since the accident, and there is reason to apprehend, that a preternatural joint is formed, a variety of plans have been proposed and practised.

The most ancient method of treatment is that of forcibly rubbing the ends of the fracture against each other, so that the irritation may make them inflame, and take on a disposition to form callus. This plan was recommended by the late Mr. John Hunter, and has had the approbation of many other distinguished modern practitioners. Mr. Hunter used even to advise us, in the case of a disunited fracture of the leg, or thigh, to let the patient get up, and attempt to walk with the splints on the limb, so that the requisite irritation might be produced. The idea of exciting a degree of inflammation in the situation of the fracture, certainly appears exceedingly rational, and, I believe, the practice has been attended with a degree of success. Mr. White records an example, in which he cured a broken thigh on this principle, a strong leather case having been made for the limb. (*Cases in Surgery, p.* 75.) The method is spoken of in Celsus: *si vetustas occupavit, membrum extendendum est, ut aliquid lædatur: ossa inter se manu dimovenda, ut concurrendo exasperentur, et ut si quid pingue est, eradatur, totumque id quasi recens fiat; &c.*

The foregoing treatment, however, is only likely to answer, before a new joint is completely formed, and, when the limb has hitherto been kept entirely motionless.

When the case is old, and there is every cause for believing, that the fracture has been completely converted into a preternatural articulation, we have been advised to cut down to the ends of the bone, rasp or saw them off, and then treat the limb, just as if the case were a recent compound fracture.

This bold practice was first suggested by Mr. Charles White: "Robert Elliot, of Eyham, in Derbyshire, a very healthful boy, nine years old, had the misfortune, about midsummer, in the year 1759, by a fall, to fracture the humerus, near the middle of the bone. He was immediately taken to a bone-setter in that neighbourhood, who applied a bandage and splints to his arm, and treated him as properly," says Mr. White, "as I suppose he was capable of for two or three months. His endeavours, however, were by no means productive of the desired effect, the bones not being at all united. A surgeon of eminence, in Bakewell, was afterwards called in; but as he soon found he could be of no service to him, and as the case was very curious, he advised the lad's friends to send him to the Infirmary at Manchester. He was accordingly brought thither the Christmas following, and admitted an in-patient. Upon examination, we found it to be a simple oblique fracture, and, that the ends of the bone rode over each other: his arm was become not only entirely useless, but even a burthen to him, and not likely to be otherwise, as there was little probability that it could ever unite, it being now six months since the accident happened.

"Amputation was therefore proposed as the only method of relief; but I could not give my consent to it, for as the boy was young, and had a good constitution, it was hardly possible that it could be owing to any fault in the solids or fluids, but that either nature was disappointed in her work by frequent friction, while the callus was forming, or rather, that the oblique ends of the bone, being sharp, had divided a part of a muscle, and some portion of it had probably insinuated itself betwixt the two ends of the bone, preventing their union. Whichever of these might be the case, I was of opinion," continues Mr. White, "that he might be relieved by the following operation, viz. by making a longitudinal incision down to the bone, by bringing out one of the ends of it, which might be done with great ease as the arm was flexible, and cutting it off, either by the saw or cutting pincers, then by bringing out the other, and cutting off that likewise, and afterwards by replacing them end to end, and treating the whole as a compound fracture.

"The objections made by the other gentlemen concerned, to this proposal, were, first, the danger of wounding the humeral artery by the knife. Secondly, the laceration of the artery by bringing out the ends of the bones. And, thirdly, that we had no authority for such an operation. As to the first, that was easily obviated, by making the incision on the side of the arm, opposite to the humeral artery. The place of election appeared to me to be at the external and lower edge of the deltoid muscle, as the fracture was very near to the insertion of that muscle into the humerus; the danger of wounding the vessel not only being by that means avoided, but, after the operation, while the patient was confined to his bed, the matter would be prevented from lodging, and the wound be easily come at, to renew the dressings. The second objection will not appear to be very great, when we consider that in compound fractures the bone is frequently thrust with great violence through the integuments, and seldom attended with laceration of any considerable artery; and as this would be done with great caution, that danger would appear very trifling. The third and last objection is no more than a general one to all improvements.

"This method which I have been proposing," proceeds Mr. White, "was at last resolved upon, and I assisted in the operation, which was performed, by a gentleman of great abilities in his profession, on January 3, in the present year (1760.) The patient did not lose above a spoonful of blood in the operation, though the tourniquet was not made use of. When the operation and dressings were finished, the limb was placed in a fracture-box, contrived on purpose, the lad confined to his bed, and the rest of the treatment was nothing different from that of a compound fracture.

"The wound was nearly healed in a fortnight's time, when an erysipelas came on, and spread itself all over the arm, attended with some degree of swelling; this by fomentations, and the antiphlogistic method, soon went off, and the cure proceeded happily, without any other interruption. In about six weeks after the operation the callus began to form, and is now quite firm. The arm is as long as the other, but somewhat smaller in consequence of such long continued bandages; he daily acquires strength in it, and will soon be fit to be discharged." (*Cases in Surgery, by Charles White, F.R.S. p. 69, &c.*)

In another instance of a broken tibia, which continued disunited an extraordinary length of time, Mr. White practised an operation, somewhat similar to the foregoing one, with complete success. He made a longitudinal incision, about four inches in length, through the integuments, which covered the fracture. By the application of a trephine, he cut off the upper end of the bone, and, as the lower end could not be easily sawn off, he contented himself with scraping it. In the course of the subsequent treatment, he had occasion to take off, with the cutting-pincers, a small angle of tibia, and to touch the lower part of the bone with the butter of antimony, as well as to introduce the same caustic between the extremities of the fracture, in order to destroy a substance, which intervened. A trifling exfoliation followed. In twelve weeks the bone was firmly united. (*Op. cit. p.* 81, 82.)

Besides Mr. White's cases, there are now some other instances, upon record, where the operation, which he first proposed, has succeeded. One is related by Mr. Rowlands, of Chester: the operation was done for the cure of a fractured thigh, which had lost all disposition to unite. (See *Medico-Chirurgical Transactions, Vol.* 2, *p.* 47.)

M. Viguerie, principal surgeon of the Hôtel Dieu, at Toulouse, has also practised Mr. White's operation with success, (See *Larrey's Mémoires de Chirurgie Militaire, Tom.* 2, *p.* 132.)

On the other hand, the operation has frequently failed. In the instance, in which I saw it executed on the humerus by Mr. Long, in St. Bartholomew's Hospital, it did not answer, though the ends of the bone were most fairly sawn off, and the case treated with particular care and skill. Boyer states, that he once performed the same operation in a similar case; but, that it had not the desired effect; (*Traité des Maladies Chirurgicales, T.* 3, *p.* 110.) Dr. Physic, of New York, when he was a student in 1785, saw this proceeding unsuccessfully adopted in a case, where the humerus remained disunited. (See *Medical Repository, Vol.* 1, *New York*, 1804.) Besides these examples, I have heard of others, in which Mr. Cline and other practitioners have tried the experiment with no better success.

What is still more discouraging, the operation has sometimes proved fatal. (See *Richerand's Nosographie Chirurgicale, Tom.* 3, *p.* 39. *Edit.* 2. *Larrey's Mémoires de Chirurgie Militaire, Tom.* 2, *p.* 132.)

The difficulties, the danger, and the frequent ill success of the foregoing operation, rendered another mode of treatment extremely desirable, when Dr. Physic, of New York, suggested the plan of introducing a seton through the preternatural joint, with a view of exciting inflammation, and bringing about an union of the bone. This suggestion promises to be a considerable improvement in modern surgery. Dr. Physic had an opportunity of performing the new operation on the 18th of December, 1802, in an example of disunited humerus, twenty months after the occurrence of the accident. "Before passing the needle (says Dr. Physic) I desired the assistants to make some extension of the arm, in order that the seton might be introduced, as much as possible, between the ends of the bone. Some lint and a pledget were applied to the orifices made by the seton-needle, and secured by a roller. The patient suffered very little pain from the operation. After a few days, the inflammation, (which was not greater, than what is commonly excited by a similar operation through the flesh in any other part) was succeeded by a moderate suppuration. The arm was now again extended, and splints applied. The dressings were renewed daily for twelve weeks, during which time no amendment was perceived; but, soon afterwards, the bending of the arm at the fracture was observed not to be so easy as it had been, and the patient complained of much more pain, than usual, whenever an attempt was made to bend it at that place. From this time, the formation of the new bony union went on rapidly, and on the 4th of May, 1803, was so perfectly completed, that the patient could move his arm in all directions, as well as before the accident happened. The seton was now removed, and the small sores occasioned by it healed up entirely in a few days. On the 28th of May, 1803, he was discharged from the hospital perfectly well, and he has since repeatedly told me his arm is as strong as ever it was." (*Dr. Physic in Medical Repository, Vol.* 1, *New York.*)

On this subject an interesting memoir was read by M. Laroche to the Ecole de Médecine at Paris (Germinal, an 13). It was entitled "*Dissertation sur la non réunion de quelques fractures, et en particulier de celles du bras, et sur un moyen nouveau de guérir les fausses articulations qui en resultent.*" The author of this production affirms, that, when he was at Augsbourg, he saw Baron Percy, then with the army of the Rhine, pass a seton through the imperfectly healed cicatrix of a compound fracture of the thigh, which fracture seemed to have lost all disposition to unite. The method answered so well, that in two months the patient was able to walk without crutches. The French assert, that this operation was done when no knowledge of Dr. Physic's case had reached France.

Mr. Brodie has also successfully employed the seton in a case of ununited broken thigh. The patient was a boy about 13. (See *Medico-Chirurgical Transactions, Vol.* 5, *p.* 387, *&c.*) In this country, likewise, the same operation has been recently practised for the cure of a disunited humerus by Mr. Stansfield, of Leeds. (See *Op. cit. Vol.* 7, *p.* 103, *&c.*) It appears that Mr. Charles Bell applied the method to a fracture of the leg, at the time when M. Roux was in England. The patient was a child six years old, and the broken bones had continued without union three years. The case had been originally mistaken by some unskilful surgeon for a mere contusion. M. Roux knew not whether the operation succeeded or not. (*Parallèle de la Chir. Angloise, &c. p.* 195.)

We are not to expect, however, that Dr. Physic's new operation will succeed in every instance. Like most other surgical means, it is liable to occasional failures, amongst which, I believe, we must include the attempt, recently made on a disunited thigh by Mr. Wardrop. (See *Medico-Chir. Trans. Vol.* 5, *p.* 365.) though certainly a partial amendment is mentioned. Dr. Hutchison was also obliged to take out the seton, in a case of ununited humerus, and no cure was effected. (See his *Practical Obs. p.* 162.) The result of a second operation by Mr. Brodie on the thigh, I am not at present acquainted with.

## PARTICULAR FRACTURES.

### *Fractures of the Ossa Nasi.*

These bones, from their situation, are much exposed to fractures. The fragments are sometimes not deranged; but, most frequently, they are depressed. In order to replace them, the surgeon must pass a female catheter, a ring-handled forceps, or any such instrument, into the nostrils, and, using it as a lever, push the fragments outwards: while, with the index-finger of the left hand, he prevents them from being pushed out too far. When the fragments are inclined to fall inwards again, authors advise supporting them with an elastic gum cannula, or lint, introduced into the nostril.

Fractures of the ossa nasi are sometimes attended with very dangerous symptoms; which may depend, either on the concussion of the brain, produced by the blow, which caused the fracture; or, on the cribriform lamella and the crista galli of the os ethmoides being driven inward, so as to injure and compress the brain.

When the symptoms of pressure on this viscus exist, (see *Head, Injuries of*) and the ossa nasi are much depressed, the surgeon must immediately raise them, together with the perpendicular process of the os ethmoides, which is connected with the cribriform lamella and crista galli. Perhaps, a pair of closed common forceps introduced into the nostrils, might best enable the surgeon to do what is necessary. In all cases, in which the ossa nasi are broken, bleeding and the antiphlogistic treatment are proper; for the vicinity of the eye renders it very liable afterwards to become inflamed; and when there are symptoms of the brain being also injured, the necessity of such practice is still more strongly indicated.

### *Fractures of the Lower Jaw.*

This bone is sometimes fractured near the chin; but, seldom so as to produce a division of the symphysis of that part, though this is not impossible. In other instances, the fractures occur near the angles of the jaw. The bone may also be broken in two places at the same time; in which event, the middle portion is extremely difficult to keep right, because many of the muscles, which draw the lower jaw downwards, are attached to that part.

The condyles and coronoid processes are also sometimes broken; the former the most frequently.

Fractures of the lower jaw may be either perpendicular to its basis, oblique, or longitudinal: of this latter, examples have been known, in which a portion of the alveolar part, with the teeth in it, was detached from the rest of the bone.

In the present cases, the soft parts are commonly contused and wounded. J. L. Petit mentions a case, in which the bone was broken, and the coronoid process quite denuded, by the kick of a horse.

Fractures of the lower jaw are deranged in the following way. When the fracture is near the symphysis, the side on which the processus innominatus is situated, is drawn downward and backward by the sub-maxillary muscles, while the other fragment is supported by the muscles which close the jaw. When the fracture is more backward, the derangement occurs in the same way, but not so easily. When the bone is fractured in two places, the middle portion is always pulled downward and backward by the muscles attached to the chin, while the two lateral pieces are kept up by the levator muscles. When the ramus of the jaw is broken, the masseter, being attached to both pieces, prevents much derangement. When the neck of the condyle is fractured, the pterygoideus externus may pull the condyle forward.

When a blow is received on the lower jaw, or the bone is injured by a fall, or by the pressure of some heavy body; when an acute pain is experienced in the part, and an inequality can be felt at the basis of the bone; when some of the teeth, corresponding to that inequality, are lower than the others; and when a crepitus is perceptible on moving the two pieces of the jaw on each other; there can be no doubt of a fracture. When the gums are lacerated, or the bone denuded by a wound, the case is (if possible) still more manifest.

Fractures of the rami and condyles, though not so easily distinguishable, may be known by the great pain felt near the ear, particularly when the jaw is moved; and the crepitus, which the surgeon can discover with his finger.

Fractures of the lower jaw, whether simple, or double, are easily set, by pushing the deranged part upward, and a little forward, and then pressing on the basis of the bone, so as to bring it exactly on a level with the portion, which has preserved its natural position. The maintenance of the reduction, however, is difficult; and can only be well executed by supporting the lower jaw, and keeping it applied to the upper one.

As soon as the fracture is set, the surgeon should adapt some thick pasteboard, previously wet and softened with vinegar, to the outside of the jaw, both along its side and under its basis. Over this moistened pasteboard, a bandage with four tails is to be applied, the centre being placed on the patient's chin, while the two posterior tails are to be pinned to the front part of a nightcap, and the two anterior ones fastened to a part of the same cap more backward. When the pasteboard becomes dry, it forms the most convenient apparatus imaginable for surrounding and supporting the fracture. A piece of soap-plaster may now be applied to the skin underneath, which will prevent any ill effects of the hardness and pressure of the pasteboard.

Until the bone is become united with some firmness, the patient should be allowed only such food as does not require being masticated, which may be given by introducing a small spoon between the teeth a little separated. Indeed, he should be recommended to live principally on broths, soups, jellies, &c.

To keep the middle portion of the bone from being drawn downward, and backward, toward the larynx, it is frequently necessary to apply tolerably thick compresses just under and behind the chin; which are to be well supported by the bandages already described.

I need hardly state the necessity of enjoining the patient to avoid talking, or moving the jaw in any manner whatever.

When the condyle is fractured, as it is incessantly drawn forward by the action of the pterygoideus externus; and, on account of its deep situation, cannot be pressed back, the lower portion must, if possible, be pushed into contact with it. For this purpose, the bandage must be made to operate particularly on the angle of the jaw, where a thick compress should be placed.

Compound fractures of the lower jaw, are to be treated on the same principles, as similar injuries of other bones. The external wound should, if possible, be healed by the first intention; and, when this attempt fails, care must be taken to keep the wound clean by changing the dressings about once in three days: oftener would disturb the fracture too much. It is observed, that compound fractures of the jaw, and even simple ones, which are followed by abscesses, are particularly liable to be succeeded by troublesome and tedious exfoliations.

In very bad fractures, in which all motion of the jaw must have the most pernicious effect, it might even be prudent to administer every kind of nourishment in a fluid form, through a hollow bougie, introduced from one of the nostrils down the œsophagus.

### *Fractures of the Vertebræ.*

The shortness and thickness of these bones do not render them very apt to be broken. The spinous processes, which project backwards, are the most exposed to such an injury; for they are the weakest and most superficially situated. The violence, which is great enough to break the vertebræ, must produce a greater, or less concussion, or other mischief, of the spinal marrow; from which accident much more perilous consequences are to be apprehended, than from the injury of the bones, abstractedly considered. The displaced pieces of bone may press on the spinal marrow, or even wound it, so as to occasion a paralytic affection of all the parts, which derive their nerves from the continuation of this substance below the fracture.

As the mere concussion of the spine may occasion symptoms, which very much resemble those, usually occurring, when the vertebræ are fractured, the diagnosis is certainly very obscure. Perhaps, an inequality in the line of the spinous processes may be observed. The lower extremities, and the rectum, and bladder, are generally paralytic; the patient is afflicted with retention of urine and feces, or with an involuntary discharge of the latter. (*Boyer.*)

Fractures of the spinous processes, without any other serious mischief, are not dangerous; and are the only instances of fractures of the vertebræ, which admit of being ascertained with certainty.

Any attempt to set fractures of the bodies of the vertebræ, even were they known to exist, would be both useless and dangerous. General treatment can alone be employed. Cupping will tend to prevent inflammation in the situation of the injury. When the patient is affected with a flatulent distention of the abdomen, vomiting, hiccough, &c. the belly may be rubbed with a camphorated liniment, and purgative clysters, and antispasmodics, given. If requisite, the urine must be drawn off with a catheter. The removal of the paralysis of the bladder, rectum, and lower extremities, if it should be inclined to take place, ought to be promoted by rubbing the back, loins, sacrum, and the limbs, with liniments containing the tinct. canthar. (*Boyer.*)

Some authors recommend trepanning, or cutting out a portion of the fractured bone, when the compression of the spinal marrow, or its injury by a splinter, is suspected; but, exclusively of the difficulty of that operation, on account of the great depth of the intervening soft parts, the indication is never sufficiently evident to authorize it. (*Boyer.*)

A fracture of the upper cervical vertebræ, or of the processus dentatus, is always suddenly fatal. In such cases, the paralysis of the diaphragm, immediately produced, affords ample cause for instantaneous death.

### *Fractures of the Sternum.*

When these accidents occur, the fractured portions may be driven inward so as to wound the pericardium, heart, or lungs; and a considerable quantity of blood may be extravasated from ruptured vessels, and collect in the anterior mediastinum. Such an effusion, however, does not cause symptoms so urgent as those, which blood extravasated beneath the cranium produces.

The symptoms of a fracture of the sternum are, inequalities of the bone; a depression, or elevation of the broken pieces; a crepitus and an unusual moveableness of the injured part in respiration; the breathing is frequently difficult, and almost always accompanied with a cough, spitting of blood, palpitations, and inability to lie on the back. According to the observations of Petit and Baldinger, several of these latter symptoms may continue with less intensity, a long while after the fracture is cured. (See *Levéillé's Nouvelle Doctrine Chirurgicale, Tom.* 2, *p.* 243.)

Fractures of the sternum, when mere solutions of continuity, only require common treatment; viz. a piece of soap-plaster to the situation of the injury, a roller round the chest, quietude, and, in particular, bleeding, with a view of preventing, what may be considered as the most dangerous consequence, inflammation of the parts within the chest.

In cases, attended with great depression of the fractured bone inward, the necessary incisions should be made, in order to raise with an elevator the portions of the bone driven inward, or extract with forceps any loose splinters, which seem to be similarly circumstanced. It is not often necessary to trephine the sternum, either to raise a depressed portion, or to give vent to extravasated fluid. Such an operation, however, may occasionally be proper, either in the examples specified, or when the bone is affected with necrosis, and the diseased part is exceedingly tedious in separating.

Fractures of the sternum are more frequently produced by gun-shot violence, than any other cause, and, in these cases, there will generally be many splinters, which will require extraction. At the battle of Marengo, the French general Champeux received such a wound, with which he lived nearly a month: the injury was attended with so many splinters, that, when they were removed, the pulsations of the heart, were visible to a considerable extent. (*Levéillé op. cit. Tom.* 2, *p.* 244.)

The ensiform cartilage, when ossified in old subjects, is liable to be fractured. Little more, however, can be done in such a case, than relaxing the abdominal muscles by raising the thorax and pelvis, and then applying a piece of soap-plaster and a roller over the part, for the purpose of keeping it steady. When the blow has been violent, the patient should always be bled.

### *Fractures of the Ribs.*

These generally happen near the greatest convexity of the bones, several of which are often broken together. The first rib, being protected by the clavicle, and the lower ribs being very flexible, are less liable to be fractured, than the middle ones.

When a spicula of a fractured rib is beaten inward, it may lacerate the pleura, wound the lungs, and cause the dangerous train of symptoms attendant on emphysema. (See *Emphysema.*)

A pointed extremity of the rib, projecting inwards, may also cause an extravasation of blood; or, by its irritation, produce inflammation in the chest. A fracture, which is not at all displaced, is very difficult to detect, particularly in fat subjects; and, no doubt, is very frequently never discovered. The surgeon should place his hand on the part, where the patient seems to experience a pricking pain in the motions of respiration, or where the violence has been applied. The patient should then be requested to cough, in which action the ribs must necessarily undergo a sudden motion, by which a crepitus will often be rendered perceptible. All the best practitioners, however, are in the habit of adopting the same treatment, when there is reason to suspect a rib to be fractured, as if this were actually known to be the case, by the occurrence of a crepitus, or the projection of one end of the fracture; which, indeed, in instances, which are displaced, makes the nature of the accident sufficiently plain.

A broken rib cannot be deranged either in the direction of the diameter of the bone, nor in that of its length. The ribs, being fixed posteriorly to the spine, and anteriorly to the sternum, cannot become shortened. Nor can one of the broken pieces become higher, or lower, than the other, because the same muscles are attached to both fragments, and keep them at an equal distance from the neighbouring ribs. The only possible derangement is either outward, or inward. (*Boyer.*)

Simple fractures of the ribs, free from urgent symptoms, require very simple treatment. The grand object is to keep the broken bones as motionless as possible. For this purpose, after applying a piece of soap-plaster to the side, and over it proper compresses; a broad linen roller is to be firmly put round the chest, so as to impede the motion of the ribs; and compel the patient to perform respiration chiefly by the descent and elevation of the diaphragm. A scapulary will prevent the bandage slipping downwards. When the fractured part seems depressed inward, the compresses should be placed on the anterior and posterior part of the bone. As a roller is very apt to become slack, many surgeons, with good reason, never employ one in the present case; but take a piece of strong linen, large enough to surround the chest, and lace it with packthread, so as to compress the ribs in the necessary manner.

When there is reason from the symptoms to think the lungs injured, or disposed to inflame, copious and repeated bleedings should be practised. Indeed, as peripneumony is always apt to succeed the accident, and is a most dangerous occurrence, every person free from debility, either having a broken rib, or supposed to have such, should always be bled in the very first instance. The spermaceti mixture, with opium, is an excellent medicine for appeasing any cough, which may disturb the fracture, and give the patient infinite pain.

### *Fractures of the Sacrum.*

These accidents do not often occur; and, when they do, must be occasioned by some powerful cause, such as the fall of a very heavy body, or the passage of a carriage wheel on the convex side of the bone, or a fall from a great height on that part. No muscle tends to derange the position of the broken portions. Indeed, the principal danger depends on the injury, which the pelvic viscera may have suffered from the same violence which broke the bone. To prevent the inflammation of such parts, of course, antiphlogistic means, particularly bleeding, are highly proper. Another source of grievous complaints, occasionally arising from fractures of the sacrum, is the injury done to the sacral nerves. Hence often proceed, retention of urine, inability to retain this fluid, involuntary discharge of the feces, paralysis of the lower extremities, &c.

With respect to the relief of these symptoms, we need add nothing to what we have already said on the subject, in speaking of fractured vertebræ. The reader must also refer to the articles, *Urine, Retention of; Incontinence of, &c.* Should the lower portion of the sacrum be displaced inward by the force applied, it is to be reduced in the same way as the os coccygis. With regard to the particular means for promoting the union of the fractured sacrum, all that can be done is to apply a piece of the emplastrum saponis to the part, and put a roller round the pelvis, or a T bandage.

### *Fractures of the Os Coccygis.*

Though much slighter than the sacrum, it is less frequently broken. Its not being much exposed to external force, and its moveableness, well account for this fact. When the os coccygis is fractured by a fall on the buttock, the pain, arising from the accident, is increased by walking, in consequence of some fibres of the glutei being attached to this bone, and disturbing it when in action. (*Boyer.*)

When the detached piece of bone is driven inward, the surgeon is to introduce his fore-finger, previously oiled, into the rectum, and with the assistance of the fingers of his other hand externally, he is to reduce the displaced part. This being accomplished, little more can be done, than applying a piece of soap-plaster to the injured part, together with a T bandage; adopting the antiphlogistic regimen, and enjoining the patient to avoid lying on his back, or sitting down. He should also avoid walking, so as to put the glutei muscles into action, which would disturb the broken bone.

### *Fractures of the Ossa Innominata.*

Such cases are not common; and, when they happen, are generally produced by the passage of heavy carriage wheels, over the pelvis; and are always attended with considerable contusion of the external soft parts, and sometimes with great injury of the pelvic viscera. The anterior superior spinous process has been broken off, by the kick of a horse. (*Boyer.*)

In St. Bartholomew's hospital, several instances occurred, during my apprenticeship to Mr. Ramsden, in which the os ilium, os ischium, and os pubis, were found fractured on opening the bodies after death; and, when we consider the great violence necessary to produce such accidents, we cannot wonder that the injured state of the pelvic viscera should frequently prove fatal. The fractures themselves are seldom displaced, so that what relates to their treatment is exceedingly simple, merely consisting in applying a roller round the pelvis, and putting a piece of soap-plaster on the broken part. The grand indication is to obviate the consequences of inflammation of the parts within the pelvis, and even of the peritonæum and abdominal viscera, by copious and repeated blood-letting. Any complaints respecting the evacuation of the urine and feces, must also be attended to. When the contusion is excessive, and the bones very badly broken, the patient cannot move nor go to stool, without suffering the most excruciating pain. To afford some assistance in such circumstances, Boyer, in a particular case, passed a piece of strong girth web under the pelvis, and, collecting the corners into one, fastened them to a pulley suspended from the top of the bed. This enabled the patient to raise himself with very little effort, so that a flat vessel could be placed under him. Certainly, a bed on the principles recommended by Sir James Earle, might be of infinite service, both in these cases, as well as in many others, particularly compound fractures and paralytic affections from diseased vertebræ. (See *Observations on Fractures of the Lower Limbs; to which is added, an account of a contrivance to administer cleanliness and comfort to the bed-ridden; by Sir J. Earle,* 1807.)

Sometimes, notwithstanding the rigorous adoption of antiphlogistic measures, abscesses cannot be prevented from forming in the pelvis; particularly, when there are detached splinters driven inwards. Such splinters may wound the bladder, and cause an extravasation of urine. Desault extracted a splinter, which had done so, from the bottom of a wound, which he had made to give exit to the effused urine. In these cases, a catheter should be kept introduced to prevent the urine from collecting in the bladder, and afterwards insinuating itself into the cavity of the abdomen. (*Chopart.*)

### *Fractures of the Thigh.*

The os femoris is liable to be broken at every point, from its condyles to its very head. It is, however, at the middle third of this extent, that fractures mostly occur. The fracture is sometimes transverse, but, more frequently oblique. The latter direction of the injury makes a serious difference in the difficulty of curing the case, without future deformity, or lameness. Sometimes the fracture is comminuted, the bone being broken in more places than one; and sometimes the case is attended with a wound, communicating with the fracture, and making it, what is termed, *compound*. As Petit remarks, however, the thigh-bone is less seldom broken into several pieces, than others more superficially situated.

A fractured thigh is attended with the following symptoms; a local acute pain at the instant of the accident; a sudden inability to move the limb: a preternatural mobility of one portion of the bone; sometimes a very distinct crepitus, when the two ends of the fracture are pressed against each other; deformity, in regard to the length, thickness, and direction, of the limb. The latter change, viz. the deformity, ought to be accurately understood; for, having a continual tendency to recur, especially, in oblique fractures, our chief trouble in the treatment is to prevent it. (*Desault, par Bichat, T.* 1, *p.* 181.)

Almost all fractures of the thigh are attended with deformity. When this is considered, in relation to length, it appears, that, in oblique fractures, the broken limb is always shorter than the opposite one; a circumstance denoting, that the ends of the fracture ride over each other. We may also easily convince ourselves, by examination, that the deformity is owing to the lower end of the fracture having ascended above the upper one, which remains stationary. What power, except the muscles, can communicate to the lower portion of the fractured bone, a motion from below upwards? At one end, attached to the pelvis; and, at the other, to this part of the bone, the patella, the tibia, and fibula, they make the former insertion their fixed point, and drawing upward the leg, the knee, and the lower portion of the thigh, they cause directly, or indirectly, the derangement in question. In producing this effect, the triceps, semitendinosus, semi-membranosus, rectus, gracilis, sartorius, &c. are the chief agents.

To shew the power of the muscles to displace the ends of such fractures, mention is made, in Desault's works by Bichat, of a carpenter, who fell from a scaffold, and broke his thigh. The limb, the next day, was as long as the other; but, the man had a complete palsy of his lower extremities, and could not discharge his urine. The moxa was applied, the muscles soon regained their power, and then the shortening of the limb began to make its appearance.

Besides the action of muscles, there is another cause producing a derangement of the fracture, in the course of the treatment.

How firm soever the bed may be on which the patient is laid, the buttocks, more prominent than the rest of the body, soon form a depression in the bedding, and thence follows an inclination in the plane on which the trunk lies; which, gliding from above downward, pushes before it the upper end of the fracture, and makes it ride over the lower one. The muscles, irritated by the points of bone, increase their contraction, and draw upward the lower part of the bone; and from this double motion of the two ends of the fracture in opposite directions, their riding over each other results. (*Desault, par Bichat, T.* 1. *p.* 183—184.)

Transverse fractures are less liable to be displaced in the longitudinal direction of the bone, because, when once in contact, the ends of the fracture form a mutual resistance to each other; the lower end, drawn upward by the muscles, meets with resistance from the upper one, which itself inclined downward by the weight of the trunk, pushes the former before it, and thus both retain their position in relation to each other.

The deformity of a fractured thigh, in the transverse direction, always accompanies that which is longitudinal; but, sometimes, it exists alone. This is the case, when, in a transverse fracture, the two ends of the bone lose their contact; one being carried outward, the other inward; or, one remaining in its place, while the other is separated. The upper end of the fracture is not now, as in the foregoing instance, motionless in regard to the muscular action; the contraction of the pectineus, psoas, iliacus internus, and upper part of the triceps, deranges it from its natural direction, and contributes to displace it.

The deformity of the limb, in regard to its direction, is either the consequence of the blow, which produced the fracture, or, what is more common, of the ill-directed exertions of those who carry the patient. Thus we see that an injudicious posture bends the two portions, so as to make an angle.

Whatever may be the kind of deformity, the lower end of the fracture may retain the natural position in which it is placed, or else undergo a rotatory motion on its axis outward, which is very common, or inward, which is more unusual. This rotation always aggravates the displaced state of the fracture, and should be attended to in the reduction. (*Desault, par Bichât, T.* 1, *p.* 185.)

Every one at all initiated in the surgical profession knows, that there are two very different methods of treating fractured thighs. In one, which was recommended and practised by Desault, and is still universally preferred in France, the limb is kept in a straight extended position. In the other, the limb is laid upon its side with the knee bent, a mode, which was extolled by the celebrated Mr. Pott, and since his time has found many partisans in this country.

That Mr. Pott lost sight of certain advantages of the straight position; that he was blind to the imperfections of the bent posture; and, also, that he grossly exaggerated the power, which we have, of relaxing all the muscles of a limb by position; few reflecting surgeons of the present day will be inclined to deny.

Were we to resign the privilege of thinking for ourselves, and implicitly to mould our opinions, according to any authority, however high, we should often fall into very avoidable errors. Were we to believe the literal sense of several passages in Mr. Pott's remarks upon Fractures, we should suppose it possible and practicable to relax at once, by a certain posture of the limb, every muscle connected with a fractured bone. In the first vol. of his works, page 389, edit. 1783, he observes, in speaking of what must best answer the purpose of incapacitating the muscles from displacing the fracture: "Is it not obvious, that putting the limb into such position as shall relax the whole set of muscles, belonging to, or in connexion with, the broken bone, must best answer such purpose?" and, in the next page, "What is the reason why no man, however superficially acquainted with his art, ever finds much trouble in setting a fractured os humeri; is it not because both patient and surgeon concur in putting the arm into a state of flexion, that is, into such a state as relaxes all the muscles surrounding the broken bone?" Also in page 393, he continues, "Change of posture must be the remedy, or rather the placing the limb in such manner as to relax all its muscles." That to have all the muscles relaxed in cases of fracture would be desirable, were it also practicable, every one will admit; but the possibility of accomplishing it, so long as different muscles have different uses, different situations, and different attachments to the bones, every one must grant to be no more than visionary. For instance, do not the patient and surgeon, in the case of fractured os humeri, adverted to above, rather concur in putting the fibres of the triceps and anconeus into a state of tension, at the same moment that they relax the biceps and brachialis internus?

The position of the fractured os femoris, says Mr. Pott, should be on its outside, resting on the great trochanter; the patient's whole body should be inclined to the same side; the knee should be in a middle state between perfect flexion, or extension, or half-bent; the leg and foot lying on their outside also, should be well supported by smooth pillows, and should be rather higher in their level, than the thigh; one very broad splint of deal, hollowed out, and well covered with wool, rag, or tow, should be placed under the thigh, from above the trochanter quite below the knee; and another somewhat shorter should extend from the groin below the knee on the inside, or rather in this posture on the upper side. The bandage should be of the eighteen-tail kind, and when the bone has been set, and the thigh well placed on the pillow, it should not without necessity, (which necessity in this method will seldom occur) be ever moved from it again, until the fracture is united; and this union will always be accomplished, in more or less time, in proportion as the limb shall have been more or less disturbed. (*Pott.*)

Here only two splints are mentioned; the surgeons of the present day always employ four. After placing the patient in a proper position, the necessary extension is to be made. Then the under-splint, having upon it a broad soft pad, and an eighteen-tailed bandage, is to be laid under the thigh, from the great trochanter to the outer condyle. The surgeon, before applying the soap plaster, laying down the tails of the bandage, and putting on the other three splints, is to take care that the fracture lies as evenly as possible.

In the position for a fractured thigh, Mr. Pott, we find, directs the leg and foot to be rather higher in their level, than the thigh; with what particular design I have not myself been able to make out. Whoever meditates upon the consequence of elevating the leg and foot above the level of the thigh, in the bent position, will know, that it is to twist the condyles of the os femoris more outward, than is natural. When a patient is placed, according to Mr. Pott's direction, upon a common bed, the middle soon sinks so much that the leg becomes situated very considerably higher than the thigh, and I am disposed to think, that this is one cause, why so many broken thighs are united in so deformed a manner, that the foot remains permanently distorted outward. The great propensity of the triceps, and other muscles to produce this effect, may also serve to explain the frequency of the deformity. It is not merely the depression of the middle of the bed which is disadvantageous: as the weight of the patient's body falls more upon one side of the bed, than the other, in the bent position of the limb, unless the sacking is tight and the mattress very firm, it happens, that such a declivity is formed, as to render it exceedingly difficult, if not impracticable, to make the patient continue duly upon his side. It cannot be enjoined too forcibly, that fractured thighs should always be laid upon beds not likely to sink much. When this happens, no rational dependance can be put in the efficacy of the bent position, and, as Desault has explained, the same thing is hurtful also in the straight posture.

The most enthusiastic advocates for the bent position must allow, that it leaves the leg and foot too moveable and unsupported, and, that though it may relax the muscles, which have the most power to disturb the coaptation of a fractured thigh, it yet leaves unrelaxed a mass of muscle quite sufficient to displace the ends of the bone. Hence, it behoves practitioners to endeavour to improve the apparatus employed, so that it may make a permanent resistance to the action of the muscles. In the straight position, such resistance may certainly be practised with most effect and convenience.

The whole tenor of Mr. Pott's observations on fractures would lead one to suppose, that from the moment a muscle is partially relaxed, it becomes incapable of acting on, or displacing a fracture. But, if this were correct, (which it cannot be) we should not have the power of completely bending, or extending our limbs, for as soon as the set of muscles, designed for this purpose, were partly relaxed by the half-flexion, or half-extension of the joint, they would be deprived of all further power. Therefore, in addition to the arguments to be brought against the bent posture, arising from its not actually relaxing all the muscles connected with the broken bone, we are also to take into the account the fact, that the partial relaxation of any muscle by no means incapacitates it from acting.

In the former editions of this Dictionary, I expressed a preference to Mr. Pott's method of treating broken thighs. More mature reflection, however, and subsequent experience, have made me a convert to the sentiments of Desault on this subject. The terrible compound fractured thighs, which I had under my care in the campaign in Holland in the year 1814, could not have been at all retained by any apparatus put merely upon the thigh itself. The superiority of long splints, extending the whole length of the limb, was in these cases particularly manifest. With such splints, which maintain steady the fracture itself, the knee, leg, ankle, and foot, your patient may, in fact, even be removed upon an emergency from one place to another, without any considerable disturbance of the broken part. But, how could this be done in the bent position, with short splints, merely applied to the thigh, affording no support to the leg, and not confining the motions of the knee, and foot?

There are some very excellent remarks on the treatment of fractured thighs in *Les Œuvres Chirurgicales de Desault par Bichat*. It is observed, that, if we compare the natural powers of displacement with the artificial resistance of most of our apparatuses, we shall find, that the disproportion between such forces is too great to make the former yield to the latter. The action of the muscles, however, which is always at first very strong, may afterwards be gradually diminished by the extension exercised on them. A power incessantly operating can effect, what another greater power temporarily applied, cannot at once accomplish, and the compression of circular bandages tends also to lessen the force of the muscles.

Desault cured in the Hôtel-Dieu an immense number of fractured thighs, without any kind of deformity. It was particularly to the well-combined employment of extension, and compression of the muscles, that such success was owing. The advantage of keeping the muscles a long while extended, in order to diminish their power, is especially evident in the reduction of certain dislocations, as those of the shoulder, in which we often cannot succeed till the muscles have been kept on the stretch for a greater, or lesser time. The fracture of the patella and olecranon equally demonstrates the utility of compression for the same purpose; as when the muscles are not compressed by the bandage they draw upward the fragment of bone with double, or triple force.

Against reducing fractured thighs in the bent posture, Desault entertained the following objections: the difficulty of making the extension and counter-extension, when the limb is so placed; the necessity of then applying them to the fractured bone itself, instead of a situation remote from the fracture, as, for example, the lower part of the leg; the impossibility of comparing with precision the broken thigh with the sound one, in order to judge of the regularity of its shape; the irksomeness of this position long continued, though it may at first seem most natural; the inconvenient and painful pressure of a part of the trunk on the great trochanter of the affected side; the derangement, to which the limb is exposed when the patient has a motion; the difficulty of fixing the leg firmly enough to prevent the effect of its motion on the thigh-bone; the manifest impossibility of adopting this method, when both thighs are fractured; lastly, experience in France having been little in favour of such posture.

Also, what is gained by the relaxation of some muscles, is lost by the tension of others. For such reasons, (certainly strong ones,) Desault abandoned the bent position, and always employed the straight one, which was advised by Hippocrates, and all the Greek physicians.

Petit, Heister and Duverney, recommend applying the extending means just above the condyles of the os femoris. Dupouy was one of the first to remark, that this practice rendered it necessary to employ very great force, and that it would be better to make the extension from the foot. Fabre takes into consideration also the inconvenience of the pressure, made on the muscles, which irritating and stimulating them to action, multiplies the obstacles to setting the fracture. Desault adopted their doctrine, for nearly the same motives, introduced it at the Hôtel Dieu, and the success he experienced in consequence, did not contribute a little to its wider diffusion.

Desault, as we have stated, preferred the straight posture, and laid his patients on surfaces, not likely to sink with the weight of the body. The feather beds, formerly in common use at the Hôtel-Dieu, had this inconvenience; for these, in cases of fractures, Desault substituted a firm, tolerably hard mattress, which did not allow the continual change of posture to occur, which a soft bed does. The object of every apparatus being to keep the ends of the fracture from being displaced, the mechanism of every contrivance, for this purpose, should be directed against the causes of the derangement. These are, 1. the action of the muscles, drawing upward the lower end of the fracture; 2. the weight of the trunk propelling downward the upper end. Hence, every apparatus, intended to prevent derangement of a thigh fractured obliquely, should, 1. draw and keep downward the lower end of the fracture; 2. carry and maintain upward the upper end of the fracture, and the trunk, which is above it. This principle is of general application, and only subject to a few exceptions in transverse fractures, attended merely with derangement in the direction of the diameter of the limb, or else none at all. 3. There must also be in the apparatus a resistance to the rotation of the lower portion of the broken bone, which will keep the limb steady, even in case of any sudden motion.

If we compare the operation of the different pieces of our apparatuses with the above indications, we shall find, that, without permanent extension, they are not very effectual. With regard to bandages, whether a roller, or eighteen-tailed bandage, be used, they all have one common mode of operating; they press the muscles towards the ends of the fracture, so as to make them form a kind of natural case for the fracture, and thus they make lateral resistance against the parts. In this manner, bandages materially aid in preventing derangement side-ways, and are particularly useful in transverse fractures. But, what is there to hinder the two inclined surfaces of an oblique fracture from slipping one over the other? What power is there to keep the limb from receiving the effects of accidental shocks? Is the pelvis kept back? Is the action of the muscles resisted? The latter is indeed somewhat diminished by the pressure, and this is the chief use of the bandage; but, will such compression be enough to prevent the longitudinal derangement of the broken bone, especially, if the bandage be applied slackly, as some advise?

These remarks apply also to compresses; *petit moyen contre une grande cause.*

Splints are useful in firmly fixing the limb, and guarding it from the effects of accidental shocks, or of contractions of the muscles. They operate more powerfully, than bandages, in preventing lateral derangement, and, hence, they suffice for transverse fractures, without any permanent extension being employed. They can also resist the rotation of the thigh outward, or inward. But, when the breach of continuity is oblique, will they hinder the ends of the bone from gliding over each other, and the consequent shortening of the limb? They obviously could only do so, by the friction of the different pieces of the apparatus, especially, the tapes, which fasten it, and then, to make the resistance effectual, they must be tied so tightly as to create a danger of mortification. Will the splints prevent the trunk from descending, and propelling before it the upper end of the fracture? Will they paralyse the action of the muscles on the lower end? Will they, in short, fulfil all the above indications? Their use is almost limited to preventing lateral derangement, and steadying the limb. Hence, they should extend along the leg, as well as the thigh, which is disturbed by the motions of the lower part of the limb.

The pads are chiefly useful in keeping the limb from being galled by the splints, and tend only trivially to keep the fracture from being displaced.

From the above account, it appears, that the ordinary pieces of apparatus, which do not execute any permanent extension, may perhaps suffice for transverse fractures, which are not common; but, that they are always ineffectual, when the division is oblique, because they do not fulfil the two-fold indication of drawing downward the lower end of the fracture, and keeping the other one upward.

Desault ascertained, that the object particularly to be aimed at, was such a disposition that the foot, leg, thigh, and pelvis, should constitute but one whole; so that, though the different parts thereof might be drawn in different directions, yet they would still, with respect to one another, preserve the same mutual relation. He invented the following apparatus to answer these purposes.

A strong splint, long enough to extend from the ridge of the os ilium to a certain length beyond the sole of the foot, is a principal part of this apparatus: this splint should be two inches and a half broad, and have each of its extremities pierced in shape of a mortice, and terminated by a semicircular niche. It is applied on the exterior side of the thigh, by means of two strong linen bands, each being more than a yard long.

The middle part of one of these bands is to be applied to the inside of the thigh, at its upper part; its ends are brought to the exterior side of the thigh, passed through the mortice, and knotted on the semicircular niche. Compresses are to be previously placed under the middle part of the band, in order to prevent any disagreeable pressure; as well as on the tuberosity of the ischium, which Desault considered as the principal point of action of this band. The inferior part of the leg is, in the next place, covered with compresses, on which the middle part of the second band is placed: the extremities of this band are crossed on the instep and upper part of the foot, then on the sole, after which they are conveyed outward, and one end passed through the mortice and knotted with the other on the niche, with such a degree of force as to pull the inferior portion of the femur downward, and to push the splint upward, and, by this means, the pelvis and superior fractured portion. On the internal side of the limb is placed a second splint, which extends from the superior part of the thigh, to a certain distance beyond the foot. A third is placed on the anterior part, and extends from the abdomen to the knee. The superior extremities of the anterior and exterior splints are fixed by means of a bandage passed round the pelvis. A band, the middle part of which is placed under the sole of the foot, and the extremities crossed on its superior surface, and fastened to the splints, prevents the motion of the foot, as do also the splints.

Before applying the apparatus, Desault covered the whole limb with compresses, wet with a solution of the acetite of lead. Over these, Scultetus's bandage used to be put, and a roller round the foot, all moistened in the same manner. For more particulars, the reader is referred to the *Parisian Chirurgical Journal, Vol. 1, Œuvres Chirurgicales de Desault par Bichat, Tom. 1; Boyer's Leçons sur les Maladies des Os; or his Traité des Maladies Chirurgicales, Tom. 3; Richerand's Nosographie Chirurgicale, Tom. 3, Edit. 4.*

*Fractures of the Neck of the Thigh-bone.*

This part of the bone may be fractured either by a fall on the great trochanter, on the sole of the foot, or the knee. But the first accident produces the injury much more frequently, than the two latter. Of thirty cases, which occurred to Desault, four-and-twenty arose from falls on the side. All those inserted by M. Sabatier in his interesting Memoir, were the result of a similar accident.

1. The fracture may take place in the middle of the neck, where there is less thickness, and the texture is not compact, as in the middle of the cylindrical bones, which are so much exposed to fractures.

2. Where it is united to the head of the bone.

3. Where it joins the great trochanter, in which event, the breach of continuity may be on the outside of the joint, which happens more frequently, than has been supposed. However, according to Boyer, this is the least frequent case; (See *Traité des Maladies Chir. T. 3, p.* 278.)

The division is seldom oblique, almost always transverse; the neck being sometimes, in the latter case, wedged in the body of the bone, as Desault found in several instances; a model of one of which, in wax, is preserved in the collection of *L'Ecole de Santé*, and the natural specimen of which was in the possession of Bichat. The fracture of the neck of the thigh-bone is sometimes complicated with that of the trochanter major.

The diagnosis is occasionally so difficult, that the best-informed practitioners cannot always ascertain the accident with certainty. At the instant of the fall, an acute pain is felt, (sometimes a crack is distinctly heard) and a sudden inability to walk occurs; the patient cannot raise himself from the ground, which, however, is not invariably the case. In the fourth vol. of the *Mem. de l'Acad. de Chirurgie*, a case is related, in which the patient walked home after the accident, and even got up the next day. Desault published a similar example. The locking of one end of the fracture in the other, may offer an explanation of this circumstance.

A shortening of the limb almost always takes place; but this symptom is more or less striking, according as the breach of continuity is out of the cavity of the orbicular ligament, which then cannot keep the bone from being retracted; or as the extremity of the fracture is confined by this ligament. The action of the muscles drawing upward the lower end of the fracture, the weight of the trunk propelling downward the pelvis and upper end of the fracture, are the two causes of the shortening of the limb. A slight effort suffices, in general, for the removal of this shortening of the limb; but, the symptom recurs almost as soon as such effort ceases; and Goursault and Sabatier have remarked, that it sometimes does not take place at all, till a long while after the accident. A swelling is observable at the upper and front part of the thigh, always proportioned to the retraction, of which it appears to be an effect.

The projection of the great trochanter is almost entirely effaced. Directed upwards and backwards, this eminence becomes approximated to the crista of the os ilium; but, if pushed in the opposite direction, it readily yields; and, when arrived at its natural level, the patient becomes capable of moving his thigh.

The knee is a little bent. Abduction of the limb always occasions acute pain. If, while the hand is placed on the great trochanter, the limb is rotated on its axis, this bony projection may be felt revolving on itself, as on a pivot, instead of describing, as in the natural state, the segment of a circle, of which the neck of the femur is the radius. This symptom, which was particularly noticed by Desault, is very manifest when the fracture is situated at the base of the neck, less so when at its middle; and it is not very perceptible when the breach is near the head of the bone. In the rotatory motions, the lower fragment rubbing against the upper one, produces a distinct crepitus, which, however, is not an invariable symptom.

The toes are usually turned outward; a position which Sabatier considers as the inevitable effect of the fracture, though Paré and Petit have noticed, that it does not constantly occur. Two cases adduced by these illustrious surgeons, were not credited by M. Louis; but the experience of Desault fully confirmed the possibility of the occurrence.

The position of the toes outward is commonly imputed to the rotator muscles. But, then it is clear, that such position ought always to exist; that all the muscles, which proceed from the pelvis to the trochanter, are, with the exception of the quadratus, in a state of relaxation, by the approximation of the femur to their point of insertion; and that the contracted muscles would not allow the foot to be so easily turned inward again. Is it not more probable, that the weight of this part itself may pull it into the position, in which it is commonly found?

It follows from the preceding account, that none of the symptoms of a fracture of the neck of the thigh-bone are exclusively characteristic; that each, considered separately, would be insufficient, and that their assemblage can alone throw light on the diagnosis. In every instance of doubt, however, the safe course must be pursued, and the apparatus applied, which, though useless, is not dangerous, should the injury not exist, and is indispensably necessary when it does. (*Desault par Bichat, T.* 1, *p.* 219—226.)

It was at one time supposed, that fractures of the neck of the thigh-bone could not be cured, without some shortening of the limb, and lameness, remaining afterwards. Professor Ludwig, Sabatier, and M. Louis, broached this doctrine, and imputed the circumstance to the destruction of the neck of the bone. That this sometimes happens has been well ascertained. A late surgical visitor to Paris informs us, that, in several specimens, which he examined in different museums, whether imperfect union, or no union at all, had followed the fracture, this absorption of the neck of the bone had taken place to a great extent, and in some to so great an extent, that the articulating surface of the bone, which plays in the acetabulum, rested between the trochanters, consolidated to the body of the bone by ligamentous union, and thickening of the surrounding parts, whilst all the intervening neck of the bone was absorbed. (See *Sketches of the Medical Schools of Paris, by J. Cross, p.* 90.) M. Roux has also nearly always found the neck of the femur shortened and deformed after its reunion. (*Parallèle de la Chir. Angloise avec la Chir. Françoise, p.* 178.) Desault, however, is said to have rarely met with instances of lameness from such a cause in his practice.

A question, that has lately been much agitated, is, whether reunion by bone ever follows cases, in which the fracture is entirely within the capsule, and the head of the bone insulated, except at its attachment to the acetabulum by the round ligament? The French surgeons decide in the affirmative, and pretend actually to demonstrate the fact by preparations in their museums. M. Roux, indeed, was good enough, a short time ago, to send over a specimen to Mr. A. Cooper, with the hope of producing conviction; but, this eminent surgeon still remains unconvinced, because the traces of reunion in the preparation appear to him to indicate a sort of fracture, where the internal fragment still retained some connexion with the capsular ligament. (*Roux Parallèle de la Chirurgie Angloise, &c. p.* 179—180.) In the museum of the Ecole de Medicine, at Paris, there are some preparations, which the professors exhibit at their lectures, in order to prove, that bony union may succeed to a fracture of the neck of the femur. These specimens were carefully examined by Mr. Cross; but, none of them proved to him, that bony union ever follows where the head of the bone becomes insulated, except at its attachment to the pelvis by the ligamentum teres. (*Sketches of the Medical Schools of Paris, p.* 93.) Boyer observes, that experience fully proves the possibility of uniting such fractures of the neck of the thigh bone, as are situated within the capsular ligament; but, he acknowledges, that there are certain circumstances, which may prevent this desirable event. "From all that has been hitherto said on the prognosis of a fracture of the neck of the femur, we may conclude, (says Boyer) that this fracture is more serious, than that of any other part of the same bone, because the difficulty of keeping it reduced is greater. That it may in general be reunited, especially in young healthy subjects; but, more easily, when it is situated near the base of the neck, than near the head of the bone. That the languid vitality of one of the fragments, and the impossibility of ascertaining whether the coaptation be exact, make the cure slow, and the time necessary for their consolidation uncertain. That the neglect of means adapted to maintaining the limb in its proper length, and natural straightness, and the fragments sufficiently motionless, may cause them to unite by an intermediate substance. Lastly, that the situation of the fracture near the head of the femur; the complete laceration of the elongation of the capsule investing the neck of the bone; the great age of the patient; and, particularly, the constitution labouring under some diathesis, which affects the osseous system; may render the cure absolutely impossible; that, in this circumstance, one of the fragments is more or less destroyed by the friction of the other against it, and in the joint a disease is formed, which tends to carry off the patient." (*Boyer Traité des Maladies Chirurgicales, T.* 3. *p.* 284.) This professor lays much stress on the complete laceration of the continuation of the capsule over the neck of the bone, as an occurrence preventive of union. But, he thinks it does not frequently happen, because the capsular ligament hinders much displacement of the fragment. (*Op. cit. p.* 278.)

### *Fracture of the Patella.*

The treatment of these cases urgently demands the adoption of the straight position, and if permanent extension can be practised with advantage in any fractures, it is certainly in these. I am glad to find, the number of advocates for Pott's method of treatment annually diminishing. Indeed, the bad effects and painful consequences of having the whole weight of the trunk operating against the fractured ends of the bone, which are often not properly in contact, are too obvious to need any comment. Yet, this injudicious pressure is made in the bent position, which also forbids the use of long effective splints, and all assistance from moderate continual extension.

This bone is almost always broken transversely, and the accident may be occasioned either by the action of external bodies, or by that of the extensor muscles. In the latter case, the fall is only consequent to the fracture, and, as Camper has remarked, is most frequently only an effect of it. For instance, the line of gravity of the body is, by some cause or another, inclined backward; the muscles in front contract to bring it forward again; the extensors act on the patella; this breaks, and the fall ensues. A soldier broke his patella in endeavouring to kick his serjeant; the olecranon has been broken in throwing a stone. A man, at the Hôtel-Dieu, fractured both bones of his knee, in the operating theatre there, by the violent spasms of the muscles, which followed an operation for the stone. The force of the muscles occasionally ruptures the common tendon of the extensor muscles, or, what is more frequent, the ligament of the patella. Petit, Desault, and Sabatier, have remarked these occurrences. The patella can only be broken longitudinally by outward violence.

The symptoms of transverse fractures are, a considerable separation between the two fragments of the bone, very perceptible to the finger, when the hand is placed on the knee. This separation is not occasioned equally by both portions, the upper one, embraced by the extensor muscles, is drawn upward very forcibly by these powers, which the patella no longer resists. The inferior portion, being merely connected with the ligament below, is, on the contrary, not moved by any muscle, and can only be displaced by the motions of the leg, to which it is attached. Hence the separation is least when the limb is extended, as it is then only produced by the upper fragment; greatest, when the limb is bent, because both pieces contribute to it; and it may be increased, or diminished, by bending the knee more or less.

The diagnosis is also made clearer, by the possibility of moving the two portions of bone transversely, so as to cause a crepitus and pain. The swelling of the knee, apt to follow fractures of the patella, may, when very great, obscure the other diagnostic symptoms. The difficulty of standing up, and the almost utter inability of walking, in consequence of the extensors not being able to move the leg, unless the fracture be very low down, are other symptoms.

The two grand indications, in the treatment of the fractured patella, are to overcome the action of the extensor muscles of the leg, and to keep this part immoveably extended. The latter object is easily accomplished; the first requires, that the contractile force of the muscles should be first lessened, so as to diminish the effort, which they make to draw up the superior portion of the bone, and then to oppose to them a mechanical resistance, which, operating in a diametrically opposite direction, will render their efforts ineffectual.

The power of the muscles is to be diminished by relaxing their fibres, which may easily be done, by bending the thigh on the pelvis, and extending the leg, and by compressing the muscles with a roller. With regard to the mechanical resistance, which must operate directly against the contraction of the muscles, and prevent them from pulling upward the superior portion of the patella, it should consist of something placed and maintained above it, with sufficient force to keep it from ascending.

Desault used to set a fractured patella as follows: one assistant fixes the pelvis, while another keeps the leg completely extended on the thigh, and this on the pelvis. The surgeon, standing on the side of the fractured limb, is to apply a longitudinal linen compress to the whole front of the leg and thigh, taking care to make two openings in it, corresponding with the sides of the patella. This strip of linen is to be then fixed, by two or three turns of a roller, at the ankle; its lower end then turned up, and the roller also applied over it. The circular bandage is next to be continued to just below the knee, when the surgeon is to push upward the lower portion of the patella, apply two or three turns of the roller just below it, in order to fix it; desire an assistant to hold the roller, enjoin him, who has the care of the longitudinal piece of linen, to draw it up firmly, while the integuments are pushed in the same direction, lest they should sink between the two pieces of the bone. The fingers of the left hand are then to be introduced into the openings of the linen compress, for the purpose of pushing downwards the upper part of the patella.

The two pieces being in accurate contact, the surgeon takes the roller again; carries it obliquely behind the ham, brings it up behind the upper part of the bone, withdraws his fingers, which served to keep it down, substitutes for them two or three moderately tight turns of the bandage, then covers the whole of the knee and thigh with the same. When arrived as high as the upper part of the limb, the assistant, who draws the longitudinal piece of linen forcibly upwards, is to turn down its ends over the circles of the roller, with a few turns of which it is then to be fixed. The bandage is then to be applied round the limb down to the ankle, where its application is to end.

The separation of the lower fragment is further to be prevented by extending the leg on the thigh, and the muscles relaxed by extending the latter on the pelvis. Nothing keeps the leg more surely extended, than a long, strong splint, which Desault next applied to the posterior part of the thigh and leg, and fixed there with a roller, while the thigh itself is to be bent by raising the whole limb, from the heel to the top of the thigh with pillows, which, of course, must form a gradual ascent from the tuberosity of the ischium to the foot.

Desault used also to keep all the apparatus wet with the saturnine lotion. (*Desault par Bichat.*)

The above method certainly fulfils every indication; and the chief trouble of the surgeon is to keep the bandages from becoming too slack. In this country, practitioners overlook many little niceties of apparatus, which the French are, perhaps, too fond of, and, in the case of a fractured patella, trust to the roller, applied with tolerable tightness, just above the upper piece of the bone, and then over the knee, in the form of a figure of 8, while the limb is kept in the above position, with a splint and pillows.

The broken patella is almost always united by a ligamentous substance, instead of a bony one. Pott, and some others, thought, that there being commonly an interspace afterwards between the two pieces of the patella, with a certain length of the connecting substance, might be advantageous in the motion of the joint; but Desault always noticed, that the greater the distance between the two pieces of the bone, the greater was the difficulty afterwards in walking up a rising, or over an unequal ground.

### *Fractures of both bones of the Leg.*

These may be transverse or oblique.

The longitudinal derangement is much less common than the horizontal or angular. In the former case, the inferior pieces are almost always drawn outward and backward, whilst the superior project internally and forward. The angular derangement may be produced either by the action of the posterior muscles of the leg, or the weight of the body, and in either case the angle will be salient anteriorly. The salient angle may take place posteriorly, if the heel be too much raised. The derangement in the circumference arises from the inclination of the foot inward or outward, which most commonly happens in the latter direction. The longitudinal derangement is extremely rare, and cannot easily take place in transverse fractures, on account of the considerable extent of the fractured surfaces; but, in oblique fractures, the inferior pieces are almost always drawn upward by the action of the posterior muscles of the leg, in which position of the parts the lower ends of the superior portions project anteriorly, and may be felt by the hand. Sometimes, however, when the solution of continuity is obliquely downward and outward, the anterior projection will be produced by the lower pieces. In some cases the pointed ends of the bones tear and penetrate the integuments in both kinds of derangement, so as to cause a compound fracture.

The usual symptoms denoting a fracture of the leg, are, change of direction and shape of the limb, pain, and incapability of motion, mobility of the fractured pieces, and a crepitus always distinct, &c.

Fractures, which take place near the knee, are not very subject to derangement, on account of the thickness of the bone at that part; but are more dangerous than those of the middle of the bone, because often followed by a stiffness of the knee-joint. Fractures of the inferior part are still more dangerous. Oblique fractures are very difficult to be managed; and when their derangement is upward and outward, the integuments are in danger of being torn by the projecting points of the superior portions of bone. (*Boyer.*)

### *Fractures of the Tibia.*

If the fracture take place near the ankle, the great extent of the fractured surfaces prevents any considerable derangement of the fractured portions; and the fibula acting as a support on the external side, contributes also to this effect.

This circumstance renders a diagnosis of fractures of the tibia often very difficult, and the difficulty is further increased by the little pain and inconvenience produced by such a fracture, with which persons have been known to walk.

Whenever there is reason to suspect the accident, in consequence of a blow or a fall on the leg, the part should be minutely examined. The fingers are to be moved along the anterior side of the tibia, the slightest inequality in which may be easily perceived, on account of its being covered only by the skin; and the motion of the pieces may be perceived, by grasping the opposite ends of the bone and pushing them in contrary directions. This motion, however, and the crepitus which accompanies it, are very indistinct, on account of the fibula not allowing the fractured portions to be sufficiently moved on one another. (*Boyer.*)

### *Fractures of the Fibula.*

Sometimes the foot is turned forcibly inwards or outwards, in which case, the ligaments of the articulation are always strained, and very frequently lacerated. It is in a case of this kind, when the foot is forcibly turned outwards, that the fibula is fractured by the pressure of the astragalus. We have given Pott's account of such accident in the article *Dislocation.*

To the fractures, produced by this cause, are to be added those resulting from a fall, or a blow on the external side of the leg, in which the bone always yields in the part to which the force is immediately applied.

Whatever be the manner, in which a fracture of the fibula is produced, the pieces are not susceptible of the longitudinal derangement; but are in all cases drawn a little towards the tibia, by the muscles placed in the interspace between them. Hence a fracture of this bone will be best ascertained by pressing the fractured portions inward. This symptom, and the consequent crepitus, may be also observed in the abduction and adduction of the foot. These signs are more evident when the fracture takes place near the ankle, than when it happens high up, where the bone is covered with thick muscles. (*Boyer.*)

### *Treatment of Fractures of the Leg.*

As in cases of fractured thighs, the practitioner may adopt either a bent or a straight position of the limb. In this country, surgeons mostly follow Mr. Pott's advice, and select the first one, of which alone I shall treat. That the bent position is, generally speaking, the most advantageous for a broken leg, I am well convinced. The strong muscles of the calf of the leg are the powers, which tend to displace the ends of the fracture, and their relaxation is a thing of the first-rate importance. It is quite different in the thigh, where the muscles are so numerous, that the attempt to relax, by any position of the limb, all such as have the power of displacing the fragments would be in vain. I am ready to acknowledge, however, that in the bent posture, the apparatus is defective, inasmuch as it does not keep the knee-joint from moving; but yet it is certain that such motion has not so injurious an effect upon fractures of the leg, as it has upon those of the thigh. When the case is complicated with a wound, which cannot be dressed in the bent posture of the limb, without great disturbance of the fracture, the straight position ought unquestionably to be preferred. With respect to one of Mr. Pott's objections to this position, viz. that it makes the knee stiff for a long while afterwards, I suspect, that we should not lay much stress upon the circumstance; because, as Boyer has correctly observed, it is always the joint situated below the fracture, that is thus affected.

"In the fracture of the fibula only, (says Pott) the position is not of much consequence; because by the tibia remaining entire, the figure of the leg is preserved, and extension quite unnecessary; but, still, even here, the laying the leg on its side, instead of on the calf, is attended with one very good consequence, viz. that the confinement of the knee, in a moderately bent position, does not render it so incapable of flexion and use afterward, as the straight or extended position of it does, and consequently, that the patient will be much sooner able to walk, whose leg has been kept in the former posture, than he whose leg has been confined in the latter.

"In the fracture of both tibia and fibula, the knee should be moderately bent, the thigh, body, and leg, being in the same position as in the broken thigh. If common splints be used, one should be placed underneath the leg, extending from above the knee to below the ankle, the foot being properly supported by pillows, bolsters, &c. and another splint of the same length should be placed on the upper side, comprehending both joints in the same manner; which disposition of splints ought always to be observed, as to their length, if the leg be laid extended in the common way, only changing the nominal position of them, as the posture of the leg is changed, and calling what is inferior in one case, exterior in the other; and what is superior in one, in the other inferior.

"If Mr. Sharp's splints be made use of, there is in one of them a provision for the more easy support of the foot and ankle, by an excavation in, and a prolongation of the lower, or fibular splint, for the purpose of keeping the foot steady." (*Pott.*)

The strong muscles of the leg being relaxed by placing the limb in the bent position, as advised by Pott, the surgeon is to make such extension as seems requisite, for bringing the ends of the fracture into even apposition. Then he is carefully to raise the leg a little way from the surface of the bed, by taking firmly hold of the limb, above and below the fracture, and elevating the broken bones together, in such a way as shall keep both the upper and lower portions as nearly as possible on the same level. At this moment, an assistant should put, exactly beneath the leg, the under splint, which has been previously got ready, by covering it with a soft pad, and laying over this an eighteen-tailed bandage. The limb is now to be gently depressed, till it rests on the apparatus. The surgeon, before proceeding further, must once more observe that the ends of the bones are evenly in contact. Being assured of this important point, he is to apply a piece of soap plaster, and lay down the tails of the bandage. Another soft pad, well filled with tow, is next to be put over the upper surface of the leg, and over that the other splint, when the straps are to be tightened.

### *Fractures of the Scapula.*

The acromion, inferior angle, neck, and coracoid process, are the parts most commonly fractured. When the acromion is broken, the weight of the arm, and the contraction of the deltoid muscle, draw it downward, while the trapezius and levator scapulæ draw the rest of the bone upward and backward. The serratus major anticus draws forward the lower angle, when this part is fractured, while the rest of the scapula remains in its natural situation; or, if the angular portion be considerable, the teres major, and some fibres of the latissimus dorsi, contribute to its derangement forward and upward.

The pectoralis minor, coraco-brachialis, and short head of the biceps, concur in drawing forward and downward the coracoid process, when it is broken. (*Boyer.*)

When the neck of the scapula is fractured, the weight of the arm makes it drop down so considerably, as to give the appearance of a dislocation; but, the facility of lifting the os brachii upward, the crepitus, and the falling of the limb downward again, immediately it is unsupported, are circumstances clearly marking, that the case is not a dislocation. Sometimes great pains, and a crepitus, are experienced, on moving the shoulder-joint, after an accident; and yet the spine, that part of the scapula, and all the above parts, are not broken. In this circumstance, we may suspect either that a small portion of the head of the os brachii, or a little piece of the glenoid cavity of the scapula, is broken off; which latter occurrence I think is not a very uncommon one.

Fractures of the acromion are attended with pain, which is increased by the motion of the arm; the form of the shoulder is changed; the broken part, which has descended, may be raised, by bringing up the elbow close to the side. (*Boyer.*)

When the inferior angle is broken, the part remains motionless, while the rest of the scapula is moved; and it is so separated, that no mistake can be made. (*Boyer.*)

Fractures of the spine and body of the bone, are all attended with a crepitus; and, in the first cases, an irregularity in the course of the spine of the bone may generally be easily felt.

### TREATMENT.

When the scapula is fractured longitudinally, or transversely, it is merely necessary to fix the arm to the side by means of a bandage, which includes the arm and trunk, from the shoulder to the elbow. Thus the motions of the shoulder, which are only concomitant with those of the arm, are prevented. (*Boyer.*)

When the inferior angle is broken, and drawn downward and forward by the serratus major anticus, the scapula must be pushed toward the fragment, by pushing the arm itself inward, downward, and forward, where it is to be kept with a roller. The fragment is also to be kept backward, as much as possible, with compresses and a roller. The arm is to be supported in a sling. (*Boyer.*)

The fractured acromion requires the arm to be so raised, that the head of the os brachii will push up the acromion, while an assistant pushes the scapula forward and downward, in a contrary direction to that of the arm. To maintain this position, a circular bandage is to be applied round the arm and body.

Desault used to apply also a small pillow under the axilla, before putting on the bandage, to make the head of the os brachii project more upward, on bringing the arm near the side. Compresses are to be placed on the scapula, which, by this means, and a roller, is to be kept downward and forward.

When the coracoid process is fractured, the muscles attached to it are to be relaxed, by bringing the arm forwards towards the breast, and confining it there in a sling; while the shoulder is kept downward and forward, and a compress confined just under the broken part, with a roller.

The treatment of a fracture of the neck of the scapula consists in raising the shoulder to its proper height; in completely taking off the weight of the arm, by means of a proper sling, which always supports the limb from the elbow to the fingers; and in entirely preventing all motion of the arm by binding it to the trunk with a roller.

### *Fractures of the Clavicle.*

This bone being long and slender, unsupported at its middle, and protected externally only by the integuments, is very often broken. Its serving to keep the scapula at a proper distance from the sternum, and as a *point d'appui* for the os brachii, every impulse of which it receives, makes its fractures still more common.

It may be broken at any part; but, its middle, where the curvature is greatest, is most frequently the situation of the injury. It is not very often fractured at its scapulary extremity. However, a direct force, falling on the shoulder, may break any part of the clavicle, on which it immediately acts. The soft parts, in this kind of case, will also be contused, or even lacerated.

A comminuted fracture may be thus occasioned, and, if the violence be very great, the subclavian vessels and nerves may be torn. The fall of a heavy body on the shoulder often gives rise to a paralysis of the arm.

When the fracturing force is applied to the ends of the bone, as by a fall on the point of the shoulder, or on the hands, while the arms are extended, the clavicle may be very much bent, and fractured so obliquely, that the broken portions shall protrude through the skin.

Fractures of this bone are usually attended with derangement of the broken ends, except when the injury takes place at the scapulary extremity, and within the ligament, tying together the clavicle and coracoid process.

The external portion of the clavicle is always that which is deranged. The internal part cannot be moved out of its natural situation, by reason of the costo-clavicular ligaments, and of its being drawn in opposite directions, by the sterno-cleido-mastoideus, and pectoralis major, muscles. The external portion, drawn down both by the weight of the arm, and the action of the deltoid muscle, and forward and inward by the pectoralis major, is carried under the internal portion which projects over it. The broken clavicle no longer keeping the shoulder at a due distance from the sternum, the arm falls forward towards the breast. The patient finds it impossible to put his hand to his forehead, because this act makes a semicircular motion of the humerus necessary, which cannot be done while that bone has not a firm *point d'appui*. The shoulder and upper extremity may be observed to be nearer the breast than those of the opposite side. The motion of the pieces of bone on one another may be felt, as well as the projection of the end of the internal portion. When the shoulder is moved, a crepitus may also be perceived, but doing this is productive of great pain, and the diagnosis is so obvious, that it is quite unnecessary.

The ancients, and many moderns, have supposed, that in order to set a fracture of the clavicle, the shoulder must be drawn back, and fixed in that position. The patient was placed on a low stool, so that an assistant might put his knee between his shoulders, which he drew back at the same time with both hands, while the surgeon applied the bandage, which was to keep the parts in this position. But, in thus drawing the shoulders towards one another, the scapula is obviously pushed towards the sternum, and with it the external portion of the clavicle, which passes under the internal one.

The figure of 8 bandage has commonly been used for maintaining the parts in this position. While the assistant keeps back the shoulders, as above described, the surgeon is to apply one end of a roller to the arm-pit on the side affected, and then make it cross obliquely to the opposite shoulder, round which it is to pass, and from this to the other shoulder, about which it is to be rolled in the same manner, and crossed afterwards repeatedly before and behind. The tightness, with which it is necessary to apply this bandage, produces a great deal of excoriation about the arm-pits, and the effect is to make the ends of the fracture overlap each other, the very thing which it is wished to avoid. Boyer remarks, that the iron-cross proposed by Heister, the corselet described by Brasdor in the *Mem. de l'Acad. de Chir.* and the leather strap recommended by Brunninghaussen, are only modifications of the figure of 8 bandage, and are not at all better.

Extension is to be made, by means of the limb, which is articulated with the fractured bone. This is done by converting the humerus into a lever, by carrying its lower end forward, inward, and upward, pushing the shoulder, backward, upward, and outward, and putting a cushion in the arm-pit to serve as a fulcrum.

Desault used to put in the arm-pit a hair or flock cushion, five or six inches long and three inches and a quarter thick at its base. Two strings are attached to the corners of the base, placed upward, which cross the back and breast, and are tied on the shoulder of the other arm. The cushion being thus placed in the arm-pit, and the fore-arm bent, Desault used to take hold of the patient's elbow, and carry it forward, upward, and inward, pressing it forcibly against the breast. By this manœuvre, the humerus carries the shoulder outward, the ends of the fracture become situated opposite each other, and all deformity is removed.

An assistant is to support the arm in this position, while the surgeon, having a single-headed roller nine yards long, is to place one end of it in the arm-pit of the opposite side, and thence apply the bandage over the upper part of the arm, and across the back to the same situation. The arm and trunk are to be covered with such circles of the roller, as far down as the elbow, drawing the bandage more tightly, the lower it descends.

Compresses, dipped in camphorated spirit, are next to be placed along the fractured bone. Desault then used to take a second roller, of the same length as the first, and put one end of it under the opposite arm-pit, whence it was carried across the breast over the compress and fracture, then down behind the shoulder and arm, and, after having passed under the elbow, upward on the breast. Desault next brought it across to the sound shoulder, under and round which he passed it, for the purpose of fixing the first turn. He then conveyed the roller across the back, brought it over the compresses, carried it down in front of the shoulder and arm, under the elbow, and obliquely behind the back to the arm-pit, where the application began. The same plan is repeated, until all the roller is spent. The apparatus is to be secured by pins, wherever they promise to be useful, and the patient's hand is to be kept in a sling.

Boyer has invented an apparatus for fractured clavicles, which is more simple, than that employed by Desault.

The cushion is to be applied under the arm. The apparatus consists of a girdle of linen cloth, which passes round the trunk on a level with the elbow. It is fixed on by means of three straps, and as many buckles. At an equal distance from its extremities are placed externally on each side two buckles, two before and two behind the arm. On the lower part of the arm, is to be laced a piece of quilted cloth, five or six fingers broad. Four straps are attached to it, which correspond to the buckles on the outside of the girdle, and serve both to keep the arm close to the trunk, and from moving either backward, or forward. (See *Boyer's Lectures upon the Diseases of the Bones.*)

Certainly, the methods recommended by Desault and Boyer are very judicious and scientific. They are not, however, much adopted in this country, perhaps in consequence of the] general aversion among English surgeons to all apparatuses, which are not exceedingly simple. It is to be hoped, at the same time, that, in the treatment of fractured clavicles, they will always attend to the principles, which Desault and Boyer have inculcated. If they understand, why the position of the arm should be such as these eminent surgeons point out, they will have no difficulty in doing what is proper, and with a cushion, sling, and a couple of rollers, they will easily maintain the proper posture.

I cannot quit this subject without cautioning the surgeon never to fall into the error of supposing the rising end of a broken clavicle to be the end which is displaced. This is the one, which is truly in its right situation, and which has often been made, by injudicious pressure, to protrude through the integuments, as I myself have seen.

### FRACTURES OF THE OS BRACHII, OR HUMERUS.

This bone may be fractured at any point of its length: in the middle, at either extremity, or above the insertion of the pectoralis major, latissimus dorsi, and teres major. This last case is termed fracture of the neck of the humerus; but that denomination has not the merit of being strictly anatomical. It is possible, however, that what is strictly called the neck of the humerus may be fractured, particularly, by a gun-shot wound. By neck of the humerus, we understand that circular narrowing, which separates the tuberosities from the head.

The fractures of this bone may be transverse or oblique, simple or compound. In short, whatever has been said of the differences of fractures in general, is applicable to those in particular. The same may be said of the causes, whether acting on the extremities of the bone, or immediately on the part fractured.

The transverse fractures of the middle part, under the insertion of the deltoid muscle, are attended with but a trifling derangement. The brachialis internus and the triceps, attached posteriorly and anteriorly to both fractured portions, counteract one another, and admit only a slight angular derangement. When the fracture takes place above the insertion of the deltoid muscle, the inferior portion is first drawn outward and then upward on the external side of the superior. Fractures of the humerus, near its lower end, such particularly as are transverse, are not subject to much derangement: an effect which is to be attributed to the breadth of the fractured surfaces; to their being covered posteriorly by the triceps muscle, and, anteriorly, by the brachialis internus, which admit only a slight angular derangement by the inferior portion being drawn a little forward.

Oblique fractures are always attended with derangement, whatever be the part fractured. The inferior portion being drawn upward by the action of the deltoides, biceps, coraco-brachialis, and long portion of the triceps, glides easily on the superior, and passes above its lower extremity. Finally, fractures of the neck of the humerus are always attended with derangement, which is produced by the action of the pectoralis major, latissimus dorsi, and teres major, which being attached to the lower portion near its superior extremity, draw it first inward and then upward, in which last direction it is powerfully urged by the biceps, coraco-brachialis, and long portion of the triceps. The superior portion itself is, in this case, directed a little outward by the action of the infraspinatus, supraspinatus, and teres minor, which make the head of the humerus perform a rotatory motion in the glenoid cavity.

We proceed to examine the different marks, by which these fractures may be ascertained.

The shortening and change in the direction of the limb, the crepitus, which may be very distinctly perceived by moving the broken pieces in opposite directions, the pain, and impossibility of moving the arm, &c. joined to the history of the preceding circumstances, render it easy to establish a diagnosis.

Fractures of the neck of the humerus are not so easily ascertained, and have been frequently, for want of attention, confounded with luxations of that bone. The diagnostic symptoms of these two affections are however very different.

When the neck of the humerus is fractured, a depression is observed at the superior extremity and external side of the arm, which is very different from that accompanying the luxation downward and inward of that bone. In the latter case, under the projection of the acromion, a deep depression is found in the part which the head of the humerus naturally occupies; whereas, in the fracture of the neck of that bone, the shoulder retains its natural form, the acromion does not project, and the depression is found below the point of the shoulder. Besides, in examining the arm-pit, instead of finding there a round tumour formed by the head of the humerus, the fractured and unequal extremity of that bone will be easily distinguished. The motion of the broken portions, and the crepitus, which may be produced by moving them, serve still further to establish the diagnosis. (*Boyer on the Bones, Vol.* 1.)

A simple fracture of the body of the humerus is not very dangerous; but, in that near the ends of the bone, there is some reason to expect the neighbouring joint to inflame, and remain stiff for some time after the cure.

In ordinary fractures of the os brachii, it is usual to apply two pieces of soap-plaster, which together surround the limb, at the situation where the accident has happened. Extension, if necessary, being now made by an assistant, who at once draws the lower portion of the bone downward and bends the elbow, the surgeon is to apply a roller round the limb. The external splint is to extend from the acromion to the outer condyle, and, being lined with a soft pad, the wood cannot hurt the limb by pressure. The internal splint is to reach from the margin of the axilla to a little below the inner condyle, and is to be well guarded with a pad, filled with tow, or any other soft materials.

Some surgeons are content with the application of two splints; but, though the two, above described, are those on which we are to place the greatest reliance, yet, as the cylindrical form of the arm conveniently allows us completely to incase this part of the limb in splints, I shall always be an advocate for the employment of four; one on the outside, one on the inside, one on the front, and another on the back of the arm. These are to be carefully fixed in their respective situations by means of tape.

The elbow and whole of the fore-arm are to be quietly and effectually supported in a sling, throughout the whole treatment of the case.

## FRACTURE OF THE HEAD, OR NECK OF THE OS BRACHII.

### 1. *General Considerations.*

Chirurgical language here differs from that adopted by anatomists, and, under the name of fracture of the neck of the humerus, is not meant, that of the circular, hardly perceptible depression, which separates the head from the tuberosities of this bone. By this expression, surgeons imply the fracture of that contracted part of the humerus, which is bounded above by these tuberosities, which below is continuous with the body of the bone; which has the tendons of the pectoralis major, latissimus dorsi, and teres major inserted below it; and which many practitioners extend even as low as the insertion of the deltoid muscle.

Indisputable facts, however, prove the possibility of the anatomical neck of the bone being fractured, and C. Larbaud shewed Bichat the humerus of a young man, aged 17, the head of which bone was accurately detached from its body, by a division which had obliquely interested the upper part of the tuberosities. But there are too few instances of this kind, in the records of surgery, to admit of our taking a general view of this sort of fracture.

### 2. *Varieties and Causes.*

The operation of external bodies, active, when driven against the shoulder, passive, when the shoulder or arm is driven against them, is the constant cause of the fracture of the neck of the humerus. The solution of continuity, thus occasioned, is sometimes direct, and at other times, the result of a *contre-coup*.

The first almost always arises from a fall on the fleshy part of the shoulder, and, as the motion must be exceedingly violent to produce this effect through the thick covering formed by the deltoid, this muscle is sometimes contused and affected with ecchymosis. Even blood may be effused from some of the ruptured articular veins, or arteries, and form a collection, which Desault has remarked should be speedily opened.*

The counter-fracture arises from a fall on the elbow, when this part is separated from the trunk, or else from a fall on the hand, which a natural instinct makes us extend, with the arm and fore-arm, to protect ourselves at the time of falling.

### 3. *Symptoms, &c.*

The whole of the symptoms of a fracture of the neck of the humerus sufficiently denote its existence; but, it is not always an easy matter to see this whole, and here more difficulties occur in the diagnosis, than in any other fracture of the humerus.

There is an acute pain experienced at the moment of the fall; sometimes, the noise of something breaking is heard. There is always a sudden inability to move the limb, which, left to itself, remains motionless. But, on external force being applied to the member, this readily yields, and admits of being moved, with the greatest ease, in every direction.

An acute pain attends such motion, which, carried too far, may cause bad consequences, as has been observed in patients in whom the fracture has been mistaken for a dislocation.

Below the acromion a depression is remarkable, always situated lower down, than that which attends the latter accident. If we place one hand on the head, while the lower part of the bone is moved in various directions with the other hand; or if, while extension is made, an assistant communicates to the bone a rotatory motion, the following circumstances are perceived. 1. We discover, that the head of the humerus remains motionless. 2. A more or less distinct crepitus, arising from the two ends of the fracture rubbing against each other. These two symptoms are invariably characteristic of the accident; but the swelling of the joint sometimes prevents us from detecting them.

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* I must enter my protest against such practice, however; both because I have observed that large extravasations of blood about the shoulder are usually very soon absorbed, and making an opening may do harm, and cannot do good.

The ends of the fracture are sometimes not at all deranged, and, as then most of the symptoms are absent, the diagnosis is rendered still more difficult. In general, however, the ends of the fracture are displaced, and, in this circumstance, it is the lower one which is out of its proper position, and not the upper one, which is of little extent, and is not acted upon by many muscles.

The displaced state of the fracture is, generally, not very perceptible, in regard to length, unless the fracture be very oblique, and its pointed spiculæ irritate the muscles, and make them contract with increased power; or unless the blow, which is very violent, continue to operate after the bone has been broken, and force the ends of the fracture from their state of apposition. In this way, the body of the bone has been known to have been drawn or driven upward, so as to protrude through the deltoid muscle, and integuments far above the height of the head of the bone.

But commonly, as Petit observes, the weight of the limb powerfully resists the action of the muscles, and the derangement of the fracture is more liable to be transverse. In this circumstance the lower end of the fracture is displaced outward or inward, and very rarely in any other direction. In the case, which is much the most frequent, the elbow is separated from the trunk, and cannot be brought near it without pain; in the instance of the bone being displaced outward, the limb has a tendency to the opposite direction.

### 4. *Prognosis.*

A fracture of the neck of the humerus is not a serious event, and if, as Heister remarks, *prope caput, fractura pejor, et difficilius curatur*, it is less on account of the nature and situation of the disease, than of the difficulty experienced in maintaining the ends of the fracture in contact.

### 5. *Reduction.*

This object usually presents but few difficulties, and the multiplicity of means formerly employed for its accomplishment, serve only to exhibit the uselessness of such resources.

Most of the machines, designed for reducing dislocations of the humerus, have been applied to this kind of fracture. To such machines succeeded the use of pulleys, weights suspended to the limb, &c. useless plans, as their only tendency was to increase the natural power, which was always more than sufficient.

Petit proposes to reduce the fracture, by first placing the arm at a right angle with the body; and then making extension with the hands of an assistant, applied above the elbow; while the counter-extension is made by another assistant, who is to take hold of the fleshy part of the shoulder. This method is liable to three kinds of inconveniences. It fatigues and even pains the patient; it lessens the extending powers by bringing them near the moveable point, it irritates such muscles as proceed from above to the lower end of the fracture, and thus increases their disposition to contract. Hence difficulties sometimes attended the reduction, which is always simple, when, the trunk being fixed, gentle extension is made on the fore-arm half bent. Desault used to accomplish the reduction in the following way.

The patient may either sit upon a chair, or the edge of a bed. The arm is to be a little separated from the trunk, and carried somewhat forward.

An assistant is to fix the trunk by drawing towards him the arm of the opposite side. This mode of making extension is preferable to that commonly employed, and which is effected by applying the hands to the upper part of the affected shoulder. The other being more distant from the resistance, there is no need for exerting so much power; and the patient's body being quite uncovered, the surgeon can conveniently apply the bandage, without deranging the extension.

A second assistant extends the fore-arm half bent, which he makes use of as a lever, placing one hand behind the wrist for the purpose of a fulcrum. The other hand, applied to the front and middle part of the fore-arm, and making pressure upon it from above downward, represents the power. The ends of the fracture, which are to be placed in apposition, form the resistance.

The relaxation of muscles, produced by the half flexion of the fore-arm, and the position of the arm a little raised from the side, are peculiarly favourable to this mode of extension, recommended by the ancients and English. This method has also the advantage of leaving uncovered every part of the limb, to which the apparatus is to be applied, and thus the assistant's hands can remain in the same position during all the time of applying whatever may be needed.

In this way the reduction takes place of itself, on employing a very little force, methodically directed, according as the fracture is displaced inward or outward. If the surgeon put his hands on the situation of the fracture, it is rather to examine the state of the ends of the broken bone than to accomplish a thing seldom required, namely, what is implied by the term coaptation.

### MEANS OF MAINTAINING THE REDUCTION.

All the apparatus for a fracture being only resistances, opposed by art to the powers causing the derangement of the broken part, it follows that the whole should act in an inverse ratio to such powers. We have seen, that these consisted; 1. Of the action of external bodies, favoured by the extreme mobility of the arm and shoulder; 2. Of the action of the latissimus dorsi, pectoralis major, and teres major, which draw inward the lower end of the fracture, or, what is more common, of the deltoid, which pulls it outward; 3. Of the contractions of the muscles of the arm, which tend to draw a little upward the said end of the fracture.

Hence, 1. to render the arm and shoulder immoveable; 2 to bring either outward, or inward, the lower end of the fracture; 3. to draw downward the same; are the three indications, which every bandage, destined for a fracture of the neck of the humerus ought to fulfil. The last object merits less attention, than the two others, because the weight of the arm is alone almost sufficient for the purpose. Desault used to employ the following apparatus for the cure of fractures of the neck of the humerus.

1. Two bandages, one about five or six ells long, the other eight or ten; both being about three finger-breadths wide. 2. Three strong splints, of different lengths, and two finger-breadths broad. 3. A linen pillow, three or four inches thick at one of its ends, terminating at the other in a narrow point, and long enough to reach from the axilla to the elbow. 4. A sling to support the fore-arm. 5. A towel to cover the whole of the apparatus.

The reduction is to be effected as above explained, and the assistants are to continue the extension. Then the surgeon is to take the first roller, which is to be wet with the aq. veg. min. and is to fix one of its heads by applying two circular turns to the upper part of the fore-arm. The bandage is now to be rolled moderately tight round the arm upward, making each turn overlap two-thirds of that which is immediately below it. When the roller has reached the upper part of the limb, it must be doubled back a few times to prevent the folds, which the inequality of the part would create. The bandage is afterwards to be carried twice under the opposite axilla, and the rest of it, rolled up, is to be brought up to the top of the shoulder, and committed to the care of an assistant.

The first splint is to be placed in front, reaching from the bend of the arm as high as the acromion. The second, on the outside from the external condyle to the same height. The third, behind, from the olecranon to the margin of the axilla. The pillow, interposed between the arm and thorax, serves as a fourth splint, which becomes useless. An assistant applies these parts of the apparatus, and holds them on by applying his hands near the bend of the arm, in order not to obstruct the application of the remainder of the bandage.

The surgeon takes hold of the bandage again, and applies it over the splints with moderate tightness, and the bandage ends at the upper part of the fore-arm, where it began.

The assistants continually keeping up the extension, the surgeon is to place the pillow between the arm and trunk, taking care to put the thick end upward, if the fracture be displaced inward; but downward, if this should be displaced outward, which is most common. It is to be attached by two pins to the upper part of the roller.

The arm is to be brought near the trunk, and fixed upon the pillow, by means of the second roller, applied round the arm and thorax. The turns of this bandage should be very tight below, and rather slack above, if the fracture be displaced inward; but, if outward, they should be slack below, and tight above.

The fore-arm is to be supported in a sling, and the whole of the apparatus is to be enveloped in a napkin, which will prevent any friction from deranging the bandages.

If we compare the effect of the above apparatus in fulfilling the indications above specified, we shall easily see, that they are very well accomplished. The arm, firmly fixed against the trunk, can only move with it, and then nothing displaces the lower end of the fracture, which is equally motionless. The shoulder cannot communicate any motion to the upper end of the fracture. The pillow, differently disposed, according to the direction, in which the lower extremity of the fracture is displaced, serves to keep this part in the opposite position.

Should this part of the bone project inward, the thick end of the pillow will remove it further from the chest. The bone will be kept at this distance from the side by the turns of the bandage, which, being very tight downward, will act upon the limb as a lever, the fulcrum for which will be the pillow, and the resistance, the action of the pectoralis major, latissimus dorsi, and teres major. Thus the bandage will have the effect of bringing the elbow nearer the trunk, and move the lower end of the fracture in the opposite direction, so that it may be here considered as an artificial muscle, directly opposing the natural ones.

When the lower end of the fracture is drawn outward, which is most commonly the case, the contrary effect will be produced, both from the pressure exercised by the bandage on the upper end of the displaced portion of the bone, and from the situation of the elbow, which is kept outward by the thick part of the pillow. The outer splint will also prevent the lower end of the fracture from being displaced outward, both by its mechanical resistance to the bone, and by compressing the deltoid muscle, which is the chief cause of the derangement in this direction. All derangement of the lower end of the fracture, forward, or backward, is prevented by the front and back splints.

All derangement, in regard to length, already prevented by the weight of the limb, is still more effectually hindered by the compression exercised on the muscles of the arm, causing such derangement both by the splints and roller. (See *Œuvres Chirurgicales de Desault, par Bichat, Tom.* 1.)

### FRACTURES OF THE LOWER END OF THE OS BRACHII, WITH SEPARATION OF THE CONDYLES.

Fractures of the os brachii, with detachment of its condyles, seem to have escaped the notice of most authors, who have written on the diseases of the bones. The ancients have transmitted to us nothing upon the subject. Heister only mentions the fracture of the lower end of this bone, with a view of making an unfavourable prognosis. This accident is not uncommon, and Desault, in particular, had frequent occasion to meet with it.

Whatever the causes of this kind of accident may be, it is commonly produced in such a way, that a longitudinal division separates the two condyles from each other, and, extending more or less upward, is bounded by another transverse, or oblique division, which occupies the whole thickness of the bone. Hence, there are three different pieces of bone, and two fractures.

Sometimes, the division is more simple. Then, taking a direction outward, or inward, it crosses obliquely downward the lower end of the os brachii, terminates in the joint, and only detaches one of the condyles from the body of the bone. The other remains continuous with it.

In the first case, the deformity is greater, and the fractured part is more moveable. When pressure is made, either before, or behind, on the track of the longitudinal fracture, the two condyles becoming further separated from each other, leave a fissure between them, and the fractured part is widened. The fore-arm is almost always in a state of pronation. On taking hold of the condyles, and moving them in different directions, a very distinct crepitus is perceived.

In the second case, the separation of the condyles from each other is not so easy; but, a crepitus can always be distinguished, on moving the detached condyle. In one case, in which the external condyle was the only one broken, Desault found the limb always supine: a position, which the muscles inserted into this part are, doubtless, concerned in producing.

An acute pain, the almost inevitable effect of bending, or extending, the fore-arm; the habitual half bent state of this part of the limb, and sometimes a subsequent swelling of it, together with more or less tumefaction around the joint, are observable in both kinds of cases. These accidents may also be complicated with wounds, splinters of bones, &c. when the blow has been very violent, or a pointed piece of the bone protrudes through the flesh.

### PROGNOSIS.

Almost all writers consider the communication of a fracture with a joint, as a fatal kind of complication. Swelling and inflammation of the adjacent parts; continuance of pain after the reduction; large abscesses; even mortification of the soft parts, and caries of the bones, are, according to such authors, the almost inevitable consequences of these fractures, and anchylosis the most favourable termination. Paré, Petit, Heister, Duverney, all give this exaggerated picture of these accidents.

Analogous fractures of the olecranon and patella shew, that this representation is magnified beyond truth. Modern observation has dispelled the ancient doctrine of the effusion of callus in the joint, and with it one of the principal causes, assigned by authors for the symptoms they so much dread.

The communication of the cavity of the joint with the external air might be thought to have more real influence; but, this can only occur in compound fractures. Desault has often learned from experience, that the contact of air is not so dangerous, as has been supposed.

The defect in the mode of treatment was, formerly, the general cause of all the ill consequences. Desault has never seen them in his extensive practice.

### REDUCTION, AND MANNER OF MAINTAINING IT.

The detached condyles, being drawn in opposite directions by the muscles of the arm and fore-arm, commonly remain unmoved between these two powers, and are but little displaced. External force may, however, put them out of their proper situation, and they may then become displaced forward, or backward, or they may separate from each other sideways, leaving an interspace between them. The apparatus should, therefore, resist them in these four directions, and this object is easily accomplished by means of four splints, kept on with a roller. The two lateral splints are, in particular, necessary, when the condyles are separated from the body of the bone, with an interspace between them. If one of them be still continuous with the humerus, the splint on this side will be of less use.

There is no occasion for the apparatus to extend as high as when the arm is fractured higher up. Of what avail, in steadying the fractured part, are the circles of the bandage, applied to the body of the bone, so much above the injury? Their only utility would consist in restraining the action of the brachialis and triceps, by compressing these muscles.

On the other hand, the roller should be continued over the fore-arm, in order that the joint, according to the judicious precept of Paulus Ægineta, may correspond to the middle of the bandage, which is here firmer, than any where else. This method is also of use by producing a gentle compression on the muscles implanted into the condyles.

Desault recommends having the front and back splints flexible at their middle part, which should be applied to the bend of the arm and elbow. (*Œuvres Chirurgicales de Desault, par Bichat, Tom.* 1.)

The detail of the reduction of the fracture, and application of the roller and splints, becomes useless after what has been said. A further account may be found in the work mentioned in the preceding paragraph.

### FRACTURE OF THE FORE-ARM.

The fore-arm is much more frequently broken, than the arm, because external force operates more directly upon it, than the latter part, especially, in falls, on the hands, which are frequent accidents.— Bichat mentions, in his account of Desault's practice, that fractures of the fore-arm often held the first place in the comparative table of such cases, kept at the Hôtel-Dieu.

We know, that the fore-arm is composed of two bones, the ulna and radius. The last is much more liable to fractures, than the first one, because it is articulated with the hand by a large surface. All the shocks, received by the latter part, are communicated to the radius. The situation of this bone more immediately exposes it to such causes, as may break it; a circumstance, which we may readily convince ourselves of on the first inspection. Both bones of the fore-arm may be broken at the same time, or one alone may be fractured. One fracture has been absurdly termed complete; the other, incomplete.

### FRACTURES OF BOTH BONES.

These may occur at the extremities, or middle of the fore-arm. They are frequent at the middle; very common below; but, seldom happen at the upper part of the fore-arm, where the numerous muscles, and the considerable thickness of the ulna, resist causes, which would otherwise occasion the accident. The bones are usually broken in the same line; but, sometimes, in two different directions. The fracture is almost always single; but, in some instances, it is double, and Desault, in particular, was one day called to a patient, over whose fore-arm the wheels of a cart had passed, so as to break the bones, at their middle and lower part, into six distinct portions. The middle ones, notwithstanding they were quite detached, united very well, with hardly any deformity.

These accidents are most commonly occasioned by direct external violence; but, occasionally, they are produced by a counter-stroke, which is generally the case, when the patient has fallen on his hand. But, in this instance, as the hand is principally connected with the lower broad articular surface of the radius, this bone alone has to sustain almost the whole shock of the blow, and hence is usually the only one broken.

### SYMPTOMS.

The symptoms, indicating fractures of the fore-arm, are not likely to lead the surgeon into any mistake. Motion at a part of the limb, where it was previously inflexible; a crepitus, almost always easily felt; sometimes a distinct depression in the situation of the fracture; a projection of the ends of the fracture beneath the skin, but, a less common symptom; pain produced by moving the part; a noise sometimes audible to the patient at the moment of the accident; an inability to perform the motion of pronation and supination; and an almost constant half-bent state of the fore-arm; are the symptoms, which, with the phenomena, common to all other fractures, characterize this one. These are sufficient to dispel all doubts, which immense swelling of the limb may create.

There is one case, however, in which, the fracture being very near the wrist-joint, similar appearances to those of a dislocation of this part may arise. But, attention to whether the styloid processes, are above, or below, the deformity, will discover whether the case be a fracture, or dislocation. In a fracture, the part is also more moveable, and there is a crepitus. (*Œuvres Chirurgicales de Desault, par Bichat, Tom.* 1.) As Boyer remarks, the two cases may be distinguished by simply moving the hand, by which motion, if there be a luxation without fracture, the styloid processes of the radius and ulna will not change their situation; but, if a fracture do exist, these processes will follow the motion of the hand. (*Boyer, Leçons sur les Maladies des Os, Tom.* 1.)

The connexion of the two bones of the fore-arm, by the interosseous ligament, which occupies the interspace by which they are separated, and the manner, in which the muscles that are attached to both, are inserted into them, render the derangement of the broken pieces in the longitudinal direction very difficult; and, in reality, a derangement in this direction has been seldom observed, and never to any considerable degree: when it does take place, it is to be ascribed to the cause of the fracture, rather than to muscular contraction. The derangement in the direction of the diameter, on the contrary, always takes place in such a manner, as that the four pieces approach one another, and the interosseous interspace diminishes, or is entirely obliterated at that part near the seat of the fracture; which approximation at the ends of the bones causes an evident deformity of the part.

To this must be added the angular deformity, which the fracturing cause always produces, either forward or backward, according to its direction.

Boyer gives the following account of the treatment of a fracture of the fore-arm, both bones being broken.

In order to adjust a fracture of these bones, the fore-arm is to be bent to a right angle with the arm, and the hand placed in a position between pronation and supination. The fore-arm and hand being thus placed, an assistant takes hold of the four fingers of the patient, and extends the fractured parts, while another assistant makes counter-extension by fixing the humerus with both his hands. By these means, the operator is enabled to restore the bones to their natural situation, and to push the soft parts into the interosseous space, by a gentle and graduated pressure on the anterior and posterior sides of the arm. Coaptation is very easy in fractures of these bones, as are indeed all the other parts of the operation, in which effort and violence are not at all required.

The fracture being thus set, the bones are kept in their place by applying first on the anterior and posterior sides of the fore-arm two longitudinal and graduated compresses, the base of which is to be in contact with the arm. The depth of these compresses should be proportioned to the thickness of the arm, increasing as the diameter of the arm diminishes. In the next place, the surgeon takes a single headed roller about six yards long, and makes three turns of it on the fractured part, descends then to the hand by circles partially placed over one another, and envelopes the hand by passing the bandage between the thumb and index: the bandage is then carried upward in the same manner, and reflected wherever the inequality of the arm may render it necessary. The compresses and bandage being thus far applied, the surgeon lays on two splints, one anteriorly, the other posteriorly, and passes the part of the bandage that yet remains over them, in such a manner as entirely to cover them. It may not be unnecessary to remark, that the compresses and splints should be of the same length as the arm. It would be useless to employ lateral splints in this case, unless (what is scarcely ever to be expected or met with) a derangement should have taken place in that direction. It is evident, that lateral splints would counteract the compresses and two other splints, by increasing the radio-cubital diameter of the arm, and by concurring with the action of the pronatores to move the pieces into the interosseous space. The surgeon's attention should be most particularly directed to preserve the interosseous space; for, if this be obliterated, the radius cannot rotate on the cubitus, nor the motion of pronation or supination be executed; and this object may be obtained with certainty by applying the compresses and splints in such a manner as that the fleshy parts may be forced into, and confined in, the interosseous space, and by renewing the bandage every seven or eight days.

If the fracture be simple, and the contusion inconsiderable, the patient need not be confined to bed; he may be allowed to walk about with his arm in a sling. (*Boyer, Leçons sur les Maladies des Os, Tom.* 1.)

### OF FRACTURES OF THE RADIUS.

Of all fractures of the fore-arm, this is the most frequent. The radius being almost the sole support of the hand, and placed in the same line with the humerus, is for both these reasons more exposed to fractures, than the ulna.

Fractures of the radius, whether transverse or oblique, near its middle part or extremities, may be caused by a fall or blow on the fore-arm, or, as happens in most cases, by a fall on the palm of the hand. When likely to fall, we extend our arms, and let the hands come first to the ground; in which case, the radius, pressed between the hand on the ground, and the humerus, from which it receives the whole momentum of the body, is bent, and, if the fall be sufficiently violent, broken more or less near its middle part. When, after an accident of this kind, pain and a difficulty of performing the motions of pronation and supination supervene, the probability of a fracture of the radius is very strong. The truth is fully ascertained by pressing with the fingers along the external side of the fore-arm. Also, in endeavouring to perform supination or pronation of the hand, a crepitus and a motion of the broken portions will be perceived, if the bone be in reality fractured. When the fracture takes place near the head of the radius, the diagnosis is more difficult on account of the depth of soft parts over the bone in that part. In this case, the thumb is to be placed under the external condyle of the os humeri, and on the superior extremity of the radius, and at the same time the hand is to be brought into the prone and supine positions. If in these trials, always painful, the head of the bone rests motionless, there can be no doubt of its being fractured. The causes of derangement are here the same as in fractures of the fore-arm, and it can never take place, except in the direction of the diameter of the bone, and is effected principally by the action of the pronating muscles. The ulna serves as a splint in fractures of the radius; and the more effectually so, as these two bones are connected with one another throughout their whole length. Notwithstanding the evident mechanism, which prevents the longitudinal derangement, J. L. Petit has thought that derangement possible. (*Boyer, Tom.* 1.)

When only the radius is fractured, no extension is ordinarily requisite. During the treatment the elbow is to be bent, and the hand put in the mid state, between pronation and supination; that is to say, the palm of the hand is to face the patient's breast. Having reduced the ends of the fracture, when they appear to be displaced, the soap plaster is to be applied, and over this a slack roller. This bandage is, indeed, of no utility; but, it makes the limb seem to the unknowing by standers more comfortable, than if it were omitted, and, as it does no harm, the surgeon may honestly apply it. However, no one can doubt, that tight bandages may act very perniciously in fractures of the fore-arm, by pressing the radius and ulna together, causing them to grow to each other, or, at all events, making the fracture unite in an exceedingly uneven manner. Only two splints are necessary; one is to be placed along the inside, the other along the outside of the fore-arm. Soft pads must always be placed between the skin and the splints, in order to obviate the pressure of the hard materials, of which the latter are formed. The inner splint should extend to about the last joint of the fingers; but, not completely to the end of the nails; for, many patients, after having had their fingers kept, for several weeks, in a state of perfect extension, have been a very long time in becoming able to bend them again.

Sometimes, it may be proper to apply a compress just under the ends of the fracture to prevent their being depressed towards the ulna too much, the consequence of which has occasionally been the loss of the prone and supine motions of the hand.

In setting a fractured radius, the hand should be inclined to the ulnar side of the fore-arm.

### OF FRACTURES OF THE ULNA.

Fractures of this bone, less frequent than those of the radius, take place generally at its lower extremity, because it is smaller and less covered at that part, than at any other. A fracture of this bone is almost always the result of a force acting immediately on the part fractured; as, for instance, when one falls and strikes the internal side of the fore-arm against a hard resisting body. On applying the hand judiciously on the inside of the fore-arm, this fracture is easily ascertained by the depression in that part, in consequence of the inferior portion being drawn toward the radius by the action of the pronator radii quadratus. This derangement is in general less, than that which takes place in fractures of the radius. The superior portion of the cubitus remains unmoved, as has been well observed by J. L. Petit.

In this case, the assistant who makes whatever little extension may be necessary, should incline the hand to the radial side of the fore-arm, while the surgeon pushes the flesh between the two bones, and applies the apparatus, as in the preceding case. In all fractures of the bones of the fore-arm, and, particularly, in those which are near the head of the radius, a false anchylosis is to be apprehended, and should be guarded against by moving the elbow gently and frequently, when the consolidation is advanced to a certain degree. (See *Boyer, Leçons sur les Maladies de Os, Tom.* 1.)

Fractures of the fore-arm always require this part to be kept quietly in a sling.

### FRACTURES OF THE OLECRANON.

The ancients seem to have been little acquainted with fractures of the olecranon, on which subject they have been quite silent, unless Paulus Ægineta alludes to it in the following passage: *Cubitus frangitur……circa partem ad cubiti gibbum.* Even most of the moderns, Petit, Duverney, B. Bell, &c. have not given a satisfactory account of such cases. The olecranon may be fractured either at its base, or its extremity; but, the first occurrence is the most frequent. The division is almost always transverse, though occasionally oblique. The causes, producing the accident, are, either the action of the muscles, which is a very uncommon one, or external violence, which is much more usual.

With regard to symptoms, the contraction of the triceps, being no longer resisted, by being connected with the ulna, draws upward the short fragment, to which it adheres, so as to produce, between it and the lower one, a more, or less evident interspace. This interspace is found situated at the back part of the joint, and it may be increased or diminished at will, by augmenting the flexion of the fore-arm, and putting the triceps into action, or else extending the limb. Another symptom, is the impossibility of spontaneously extending the fore-arm, the necessary effect of the detachment of the triceps from the ulna. The fore-arm is constantly half-bent, the biceps, and brachialis having no antagonists. The olecranon is, more or less conspicuously, drawn up higher, than the condyles of the os brachii, which latter parts, on the contrary, are naturally situated higher, than the olecranon, when the fore-arm is half-bent. The upper piece of bone may be moved in every direction, without the ulna participating in the motion. Besides these symptoms, we must take into the account, the considerable pain experienced, the crack sometimes distinctly heard by the patient, and the crepitus frequently perceptible.

The indications are to push downward the retracted portion of the olecranon, and to keep it in this position, at the same time, that the ulna is made to meet it, as it were, by extending the fore-arm. Desault says, however, it should not be completely extended, as when the pieces of bone touch at their back part, they leave a vacancy in front, which is apt to be followed by an irregular callus, prejudicial to the future free motion of the elbow. Hence, this celebrated practitioner used to put the arm between the half bent state and extension. This posture, however, would soon be changed, if permanent means were not taken to maintain it. Desault, with this view, was in the habit of applying a splint along the fore-part of the arm. But, position evidently only operates on the lower part of the olecranon, by approximating it to the upper one. The latter requires also to be brought near the former, and fixed there, which is, doubtless, the most difficult object to effect, because the triceps is continually resisting.

Desault used to adopt the following method: the fore-arm being held in the above position, the surgeon is to begin applying a roller round the wrist, and to continue it as high as the elbow. The skin, covering this part, being wrinkled in consequence of the extension of the limb, might insinuate itself between the ends of the fracture, and consequently it must now be pulled upward by an assistant. The surgeon is then to push the olecranon towards the ulna, and confine it in this situation with a turn of the roller, with which the joint is then to be covered, by applying it in the form of a figure of 8.

A strong splint, a little bent, just before the elbow, is next to be laid along the arm and fore-arm, and fixed by means of a roller. The apparatus being applied, the whole limb is to be evenly supported on a pillow.

The cure of the fractured olecranon is seldom effected by the immediate reunion of its fragments: there generally remains a greater or lesser interspace between them, which is filled up by a substance not of a bony consistence. It is true, such interspace is smaller when the fore-arm has been kept extended; but, this advantage does not at all counterbalance the unpleasant stiffness of the joint, which is the inevitable consequence of a posture so unfavourable to the functions of the limb. (*Boyer, Traité des Maladies Chir. T* 3, *p.* 226.) This author cites several facts, which prove, that when the fractured olecranon is entirely neglected from the case not being understood, the fragments are still united by a ligamentous substance, and that when an interspace of half an inch is thus left between them, the strength and motion of the elbow become perfect.

It was Camper, who first pointed out the inutility of keeping the arm perfectly extended: he found patients recover sooner and better, when the elbow was kept half bent, and the joint gently exercised at as early a period as possible.

It is calculated, that, on an average, the olecranon becomes firmly united about the twenty-sixth day. (*Desault par Bichat.*)

### FRACTURES OF THE FINGERS.

On this subject, we need only remark, that the treatment consists in applying a piece of soap-plaster, rolling the part with tape, incasing it in pasteboard, sometimes placing the hand on a flat splint, or finger-board, and always keeping the hand, fore-arm, and elbow, well supported in a sling.

*For Fractures of the Cranium*, see *Head, Injuries of.*

For information on fractures consult particularly, *Petit's Traîté des Maladies des Os; Duverney's Traité des Maladies des Os; W. Sharp in vol.* 57. *of the Philosophical Trans. part* 2, 1767. *Pott's Remarks on Fractures and Dislocations. Cases in Surgery by C. White, F. R. S. Edit.* 1770. *Boyer's Leçons sur les Maladies des Os, redigées en un Traité complet de ces Maladies, par Richerand, or the English Translation by Dr. Farrell; also Boyer's Traité des Maladies Chirurgicales, Tom.* 3; *Encyclopédie Methodique, Partie Chirurgicale, Art. Fracture, Cuisse, Omoplate, Ilium, &c. &c. Œuvres Chirurgicales de Desault, par Bichat, Tom.* 1. *Parts of the Parisian Chirurgical Journal. Richerand's Nosographie Chirurgicale, Tom.* 3, *Edit.* 4. *Levéillé's Nouvelle Doctrine Chirurgicale, Tom.* 2, 1812. *Roux, Relation d'un Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 173, *&c. Paris,* 1815. *Medico-Chirurgical Transactions, Vol.* 2, *p.* 47, *&c.; Vol.* 5, *p.* 358, *&c.; Vol.* 7, *p.* 103. *Sketches of the Medical Schools of Paris by J. Cross, p.* 87, *&c.*

**FRÆNUM LINGUÆ.** (from *fræno*, to curb.) It occasionally happens, in infants, that their tongues are too closely tied down, by reason of the frænum being extremely short, or continued too far forwards towards the point. In the latter case, the child will not be able to use its tongue, with sufficient ease in the action of sucking, swallowing, &c. in consequence of the point being confined at the bottom of the mouth. Though this affection, however, is not unfrequent, yet, it is much less common, than it is generally supposed to be by parents and nurses. When the child is small, and the nurse's nipple large, it is common for her to suppose the child to be tongue-tied, when, in fact, it is only the smallness of the child's tongue, that prevents it from surrounding the nipple, so as to enable it to suck with facility. Mothers also commonly suspect the existence of such an erroneous formation whenever the child is long in beginning to talk.

The reality of the case may always, however, be easily ascertained by examining the child's mouth. In the natural state, the point of the tongue is always capable of being turned upward towards the palate, as the frænum does not reach along about a quarter of an inch of the lower part of the tongue from the apex. But, in tongue-tied children, by looking upon one side, we may see the frænum extending from the back part to the very point, so that the whole length of the tongue from the back part to the very point, is tied down, and unnaturally confined in its motion.

The plan of cure is to divide as much of the frænum as seems proper for setting the tongue at liberty. The incision, however, should not be carried more extensively backward, than is necessary, lest the raninal arteries should be cut; an accident, that has been known to have proved fatal. For the same reason, the scissars used for this operation, should have no points. I think the following piece of advice, offered by a modern author, may be of service to practitioners, who ever find it necessary to divide the frænum linguæ: "It is not the relations of the trunk of the lingual artery alone, which the student ought to make himself acquainted with. He will do well to study the position of the arteria ranina in respect to the frænum linguæ. This information will teach him the impropriety of pointing the scissars upward and backward, when snipping the frænum, an operation, by the by, oftener performed, than needed. He will learn, that the ranular artery lies just above the attachment of the frænum; so that if he would avoid it, he must turn the points of the scissars rather downward; if he do not, the artery will probably suffer. (*A. Burns on the Surgical Anatomy of the Head and Neck, p.* 239.)

When an infant has the power of sucking, this proceeding should never be resorted to, even though the frænum may have the appearance of being too short, or extending too far forwards. (*Fab. Hildanus, centur.* 3. *Obs.* 28; *Petit, Traité des Maladies Chirurgicales, Tom.* 3, *p.* 265, *Edit.* 1774.)

Although the operation of dividing the frænum linguæ is for the most part done without any bad consequences, surgeons should remember well, that it is liable to dangers, especially, when performed either unnecessarily, or unskilfully.

Besides the fatal events, which have occasionally resulted from wounding the raninal arteries, the records of surgery furnish us with proofs, that the mere bleeding from the raninal veins, and the small vessels of the frænum may continue so long, in consequence of the infant's incessantly sucking, as to produce death. In such cases the child swallows the blood, as fast as it issues from the vessels, so that the cause of death may even escape observation. But, if the body be opened, the stomach and intestines will be found to contain large quantities of blood. (See *Dionis, Cours d'Operations de Chirurgie, 7e Demonstration; and Petit's Traité des Maladies Chirurgicales, Tom.* 3, *p.* 282, *&c.*)

Another accident, sometimes following an unnecessary, or too extensive a division of the frænum, consists in the tongue becoming thrown backward over the glottis into the pharynx, where it lies fixed, and causes suffocation. The observations of Petit on this subject are highly interesting. (See *Op. cit. Tom.* 3, *p.* 267, *&c.*)

Lastly, it should be known, that an infant's inability to move its tongue, or suck, is not always owing to a malformation of the frænum. Sometimes the tongue is applied and glued, as it were, to the roof of the mouth, by a kind of mucous substance, and in this case, it should be separated with the handle of a spatula. By this means infants have been saved, which were unable to suck during several days, and were in imminent danger of perishing from want of nourishment. (See *Mémoires de l'Acad. de Chirurgie, Tom.* 3, *p.* 16, *Edit.* 4*to.*)

See particularly *Petit's Traité des Maladies Chirurgicales, Tom.* 3, *p.* 260, *&c. Dionis Cours d'Opérations, 7e Demonstr. Sabatier's Médecine Opératoire, Tom.* 3, *p.* 132, *&c. Lassus, Pathologie Chirurgicale, Tom.* 2, *p.* 454. *Richerand's Nosographie Chirurgicale, Tom.* 3, *p.* 284, *Edit.* 2. *Richter's Anfangsgrunde der Wundarzneykunst, Band.* 4, *Kap.* 2, *p.* 11. *Edit.* 1800.

**FRAGILITAS OSSIUM.** A morbid brittleness of the bones. The gelatinous part of the bones, to which they owe their flexibility, may be so deficient in them, that they are broken by the slightest causes. The state of a bone, thus distempered, may be well conceived, by comparing it with that of a calcined one.

Boyer imputes the *mollities ossium* to a deficiency of lime in their structure; the *fragilitas ossium* to a deficiency of the soft matter naturally entering into their texture. He states, that a certain degree of the fragilitas ossium necessarily occurs in old age, because the proportion of lime in the bones naturally increases as we grow old, while that of the organized part diminishes. Hence, the bones of old persons more easily break, than those of young subjects, and are longer in uniting again.

In persons, who have been long afflicted with cancerous diseases, the bones are said to become sometimes as brittle, as if they had been calcined. Saviard and Louis relate such cases. The latter mentions a nun, who broke her arm by merely leaning on a servant; and in the London Medical Journal an account is given of a person, who could not even turn in bed, without breaking some of his bones.

The bones are said sometimes to be remarkably brittle in the latter stages of syphilis.

In bad cases of scurvy, the bones occasionally become so brittle, that they are broken by the slightest causes, and do not grow together again.

The fragilitas ossium of old age is incurable: that which depends on some other constitutional disease can only be relieved by a removal of the latter. (See *Boyer on Diseases of the Bones, Vol.* 2.)

This author, in one of his last works, expresses his opinion, that the doctrine of mollities and fragilitas ossium being distinct different diseases, is by no means sufficiently proved by a due number of accurate observations. (*Traité des Maladies Chirurgicales, T.* 3, *p.* 607—608.) Consult also *Janus de Burgo de Admirandâ Fragilitate Ossium, in Opera Fabricii Hildani, p.* 140. *D'Aubenton Description du Cabinet du Roi, Tom.* 3. *Ossa Veneorum sponte fracta. Meckren, Obs. Med. Chir. p.* 341, *Amst.* 1682. *Weidmann de Necrosi Ossium, p.* 2, *Francofurti* 1793; *and the writings of Duverney, Petit, and Pringle.*

**FUNGUS.** Any sponge-like excrescence. Granulations are often called *fungous* when they are too high, large, flabby, and unhealthy.

**FUNGUS HÆMATODES.** (from *fungus*, and αἱμα, blood.) *The Bleeding Fungus. Spongoid Inflammation. Soft Cancer. Carcinome Sanglante. Medullary Sarcoma.*

This disease has only been accurately described of late years, having before been generally confounded with cancer. The public are indebted to Mr. Burns, of Glasgow,* for the first good account of it; and the subsequent publications of Mr. Hey, of Leeds, Mr. Freer, of Birmingham, and Mr. J. Wardrop, have made us still better acquainted with the subject.

It is perhaps one of the most alarming diseases, incidental to the human body, because, we know of no specific remedy for it; and an operation can only be useful at a time, when it is very difficult to persuade a patient to submit to it.

Indeed, when the diseased part is extirpated at an early period, a recovery hardly ever follows; for, experience proves, that it is not a disease of a local nature, but almost always extends to a variety of organs and structures at the same time, either to the brain, the liver, or lungs, &c. It is of the utmost consequence to be aware of this fact, since we should otherwise be induced to attempt many hopeless operations, and deliver a prognosis, that might cause disappointment and censure. In a large proportion of patients, afflicted with fungus hæmatodes, the general disorder of the system is indicated by a peculiarly unhealthy aspect; a sallow, greenish yellow colour of the skin, which is frequently covered with clammy perspiration; constant troublesome cough; difficulty of breathing; &c.

*Fungus Hæmatodes*, is the name used by Mr. Hey. Mr. Burns has called it *spongoid inflammation*, from the spongy elastic feel, which peculiarly characterizes it, and which continues even after ulceration takes place. The fungus hæmatodes has most frequently been seen to attack the eyeball, the upper and lower extremities, the testicle, and the mamma. But, the uterus, ovary, liver, spleen, lungs, thyroid gland, hip and shoulder joints, have been the seat of the disease. A distemper, which presents itself in so many parts, must be subject to variety in its appearances.

### *Fungus Hæmatodes of the Eye.*

1. When it attacks the eye, the first symptoms are observable in the posterior chamber. The pupil becomes dilated and immoveable, and, instead of having its natural deep black colour, it is of a dark amber, and sometimes of a greenish hue. The change of colour becomes gradually more and more remarkable, and, at length, is discovered to be occasioned by a solid substance, which proceeds from the bottom of the eye towards the cornea. The surface of this substance is generally rugged and unequal, and ramifications of the central artery of the retina may sometimes be seen running across it. The front surface of the new mass, at length, advances as far forwards as the iris, and the amber, or brown appearance of the pupil, has, in this stage, been known to mislead surgeons into the supposition of there being a cataract, and make them actually attempt couching. The disease continuing to increase, the eyeball loses its natural figure, and assumes an irregular knobby appearance. The sclerotica also loses its white colour, and becomes of a dark blue, or livid hue. Sometimes, matter now collects between the tumor and the cornea. The latter membrane in time ulcerates, and the fungus shoots out. In a few instances, it makes its way through the sclerotica, and is then covered by the conjunctiva. The surface of the excrescence is irregular, often covered with coagulated blood, and bleeds profusely from slight causes. When the fungus is very large, the most prominent parts slough away, attended with a fetid sanious discharge. In the course of the disease the absorbent glands, under the jaw, and about the parotid gland, become contaminated. On dissection, a diseased mass is found extending forwards from the entrance of the optic nerve, the vitreous, crystalline, and aqueous humours being absorbed. The retina is annihilated, and the choroid coat propelled forwards, or quite destroyed. The tumour seems to consist of a sort of medullary matter, resembling brain. The optic nerve is thicker and harder than natural, of a brownish ash-colour, and destitute of its usual tubular appearance. In other cases, the nerve is split into two or more pieces, the interspaces being filled up with the morbid growth. Even the brain has been observed to share in the disease, sometimes dark-red spots appearing on the dura mater; sometimes small spots, containing a fluid-like cream, being found between the pia mater and tunica arachnoides. When the lymphatic glands are enlarged, they are also found converted into a kind of medullary matter, similar to that which composes the diseased mass in the eyeball. When the skin bursts over a diseased absorbent gland, a sloughy ulcer is produced; but, no fungus is emitted, unless the affection of the gland with fungus hæmatodes be primary. Fungus hæmatodes of the eye has been erroneously regarded as cancer by the best writers. We learn from Bichat, that more than one-third of the patients on whom Desault operated for *supposed* carcinoma of the eye, were under twelve years of age. Twenty, out of twenty-four cases of fungus hæmatodes of the eye, with which Mr. Wardrop has been acquainted, happened to children under twelve years of age. Now, as cancer is rather a disease of aged, than young persons, and we find, from Mr. Wardrop, that fungus hæmatodes of the eye mostly affects persons under twelve years of age, it is tolerably certain, that most of Desault's cases, reported to be cancers of the eye, were in fact the equally terrible malady now engaging our consideration. The sight of young subjects is generally destroyed, before the attention of parents is excited to the distemper. Frequently, however, a blow, followed by ophthalmy, precedes the growth of the diseased mass. When no external violence has occurred, the first symptom is a trivial fulness of the vessels of the conjunctiva, the iris becoming, at the same time, extremely vascular, and altered in colour, and the pupil dilated and immoveable. There is seldom much complaint made of pain; but, the child is sometimes observed to be languid and feverish. In adults, the fungus hæmatodes of the eye generally comes on without any apparent cause, though sometimes in consequence of a blow. At first, the tunica conjunctiva is slightly reddened, and vision indistinct. The redness and obscurity of sight increase slowly, and an agonizing nocturnal headach is experienced, the eye bursts, and the humours are discharged.

With regard to the cure of the fungus hæmatodes of the eye, the only chance of effecting this desirable object depends upon the early extirpation of the diseased organ. It must be acknowledged, however, that most of the operations, in which the morbid eye has been removed, have hitherto proved unsuccessful, owing to a recurrence of the disease. The reason of such ill success may be imputed to the optic nerve being almost always in a morbid state, before an attempt is made to remove the eye. The operation has always been found to fail, when the disease is advanced so far, that the posterior chamber is filled by the fungous mass. Since no internal medicines, nor external applications, afford the least hope of checking any form of the fungus hæmatodes, it is manifest, that, when the distemper of the eye exceeds certain bounds, the miserable patient is placed beyond the reach of any effectual aid from surgery. (See particularly *Wardrop's Observations on Fungus Hæmatodes.*)

### *Fungus Hæmatodes of the Limbs.*

2. In the extremities the disease begins with a small colourless tumour, which is soft and elastic, if there be no thick covering over it, such as a fascia; but otherwise is tense. At first, it is free from uneasiness; but, by degrees, a sharp acute pain darts occasionally through it, more and more frequently, and, at length, becomes incessant. For a considerable time, the tumour is smooth and even; but, afterwards, it projects irregularly at one, or more points; and the skin at this place becomes of a livid red colour, and feels thinner. In this situation, it easily yields to pressure, but instantly bounds up again. Small openings now form in these projections, through which is discharged a thin bloody matter. Almost immediately after these tumours burst, a small fungus protrudes, like a papilla, and this rapidly increases, both in breadth and height, and has exactly the appearance of a carcinomatous fungus, and frequently bleeds profusely. The matter is thin, and exceedingly fetid, and the pain becomes of the smarting kind. The integuments, for a little way round these ulcers, are red, and tender. After ulceration takes place, the neighbouring glands swell, and assume exactly the spongy qualities of the primary tumour. If the patient still survive the disease in its present advanced progress, similar tumours form in other parts of the body, and the patient dies hectic.

After death, or amputation, the tumour is found to consist of a soft substance, somewhat like the brain, of a greyish colour, and greasy appearance, with thin membrane-like divisions running through it, and cells, or abscesses, in different places, containing a thin bloody matter, occasionally in very considerable quantity. There does not seem uniformly to be any entire cyst, surrounding the tumour; for, it very frequently dives down betwixt the muscles, or down to the bone, to which it often appears to adhere. The neighbouring muscles are of a pale colour, and lose their fibrous appearance, becoming more like liver, than muscle. The bones are always carious in the vicinity of these tumours.

The distemper is sometimes caused by external violence, though in general there is no evident cause whatever. (*Dissertations on Inflammation by J. Burns, Vol. 2.*)

Mr. Hey has given several cases of the fungus hæmatodes. If we notice the most particular circumstances, relative to one of these, it will suffice to inform our reader of the form, in which this terrible affliction has presented itself in this gentleman's practice.

A young man, aged twenty-one, two years before applying to Mr. Hey, perceived a small swelling on the inside of the right knee, not far from the patella. This tumour was moveable, and did not impede the motion of the joint: it was not discoloured, but was painful, when moved, or pressed upon. It continued in this state half a year, and then the man, having hurt his knee against a stone, it gradually increased in bulk, but did not exceed the size of an egg. The skin was now discoloured with blue specks, which were taken to be veins. He could still walk with ease, and follow his business.

Two months before his admission into the Leeds Infirmary, he met with a fall, and violently bent his knee, but did not strike it against any thing. The tumour began immediately to enlarge; and, within a few hours, it extended half way up the inside of his thigh. About a fortnight after this accident, the skin burst at the lowest part of the tumour, and discharged some blood. A dark-coloured fungus, about the size of a pigeon's egg, here made its appearance, and, a few weeks afterwards, the skin burst at another part of the large tumour, and some blood was again discharged. From the fissure arose another fungus, which had increased, in the course of the last week, to the size of a small melon, and now measured eight inches from one side of its base to the other. The base of the fungus frequently bled, especially, when the man allowed his limb to hang down.

The whole tumour was now of an enormous size, being nineteen inches across, when the measure was carried over the last-mentioned fungus. From its highest part in the thigh to the lowest part, just below the knee, it measured seventeen inches, without including the fungus. The base of the tumour at the knee, exclusive of that part, which ran up the thigh, measured twenty-four inches in circumference. The tumour was situated on the inner side of the limb, and was distinctly defined. The skin, covering the disease, was in some places livid, and had several fissures and small ulcerations upon it; but, had not burst asunder, except in the two places above described. The tumour was soft, and gave a sensation of some contained fluid, when gently pressed with the hands alternately in opposite directions. The patient said he had walked without pain in his knee, a week before his admission into the Infirmary; he had lost very little blood in his journey to Leeds. He complained of the greatest uneasiness in the highest part of the tumour. It had become hot and painful in the night-time, for some days past. His pulse was 114 in a minute; his tongue was clean; and his appetite had been good, till the last few days. He had never felt any pulsation in the tumour.

In a consultation it was determined, that the tumour should be laid open, by cutting off a portion of the distended integuments; and that after removing the contents, if the sac should be found in a sound state, the disease should be treated as a simple wound; but, if in a morbid state, amputation of the limb should be immediately performed.

A large oval piece of the integuments being removed, the tumour was found to contain a very large quantity of a substance, not much unlike coagulated blood; but more nearly resembling the medullary part of the brain in its consistence and oily nature. It was of a variegated reddish colour, in some parts approaching to white, and, as blood issued from it, Mr. Hey conceived it was organized. This mass was partly diffused through the circumjacent parts in innumerable pouches, to which it adhered, and was partly contained in a large sac of an aponeurotic texture, which was connected with the capsule of the kneejoint. There was a great and universal effusion of blood from the internal surface of the sac, and from the pouches, containing this morbid mass.

Amputation of the limb was immediately performed, on finding such to be the nature of the case. Mr. Hey, unfortunately, however, left a portion of the diseased surface behind on the inner part of the thigh, and hoping that a small narrow portion of the upper part of the sac would soon become a clean sore, and not impede the cure, he made the circular incision two inches below its higher part.

On examining the amputated limb, the vastus internus was found to be brown, and much softer, than the other muscles, which were healthy. There were many small portions of blood extravasated in the substance of this muscle. The sac was formed of the aponeurotic covering of the muscle, and ended below where this aponeurosis begins to cover the capsular ligament of the knee. The two fungous substances, above described, appeared to have been only extensions of the morbid mass, where this had made its way through the sac and the integuments. The joint of the knee, and muscles of the leg, were perfectly sound.

I need not detail all the particulars after the operation. Suffice it to say, the man suffered a great deal of constitutional disorder. After a few weeks, the granulations upon the stump became good, and the cicatrization was nearly completed at the end of the sixth week, after the amputation. At this period, the small and superficial portion of the upper part of the great sac, which Mr. Hey had unfortunately left, was now healed; but, a tumour, now about four inches in length, and between two and three in breadth, had gradually risen at the lower and under part of the thigh, beneath the cicatrix. This contained a soft substance, exactly similar, as far as the touch could discover, to that which had filled the large sac. This tumour became painful, and sometimes discharged a bloody serum, sometimes dark-coloured blood, through four or five small openings in the cicatrix.

Mr. Hey laid open the tumour, and removed its contents; but no advantage was gained by this proceeding. The interior surface was found to be too much diseased to produce good granulations. Blood continued to ooze out of the wound for a few days. Then the inner surface became covered with a blackish substance, which gradually extended itself, and formed a new fungus. A variety of escharotics were applied to destroy the fungus and morbid surface of the wound; but, to no purpose, the growth of the fungus always exceeded the quantity destroyed. Undiluted oil of vitriol, applied freely, had very little effect.

An attempt was once more made to cut away the disease; but, on examining the wound carefully, after the contained substance was removed, the muscular substance was found degenerated into a hard mass, which felt somewhat like cartilage. The adipose membrane was also diseased, and formed into large cells, which had contained the fungus substance. Hence, another amputation seemed the only resource.

After this operation, the whole surface of the stump seemed sound, except the principal artery, which was filled with a somewhat stiff matter, resembling coagulated blood, which prevented its bleeding. The inside of the vessel, on being touched with the scalpel, felt hard, and communicated a sensation, like that of scraping bone.

The man was sent home, as soon as his state would admit of it; but, he died consumptive about six months afterwards. Besides this instance, in the thigh, Mr. Hey relates cases of fungus hæmatodes, situated in the female breast, in the leg, in the neck (extending from the jaw to the clavicle, and producing suffocation), on the back part of the neck, on the back part of the shoulder, and at the extremity of the fore-arm, near the wrist.

"If I do not mistake, (says Mr. Hey,) this disease not unfrequently affects the globe of the eye, causing an enlargement of it, with the destruction of its internal organization. If the eye is not extirpated, the sclerotis bursts at the last, a bloody sanious matter is discharged, and the patient sinks under the complaint." (*P.* 283.)

Besides some cases, in similar situations, to those mentioned by Mr. Hey, one is related by Mr. Burns, in which the hip-joint was the seat of this terrible affection. After detailing the progress of the case to the poor man's death, this author states, that he found, on dissection, the hip-joint completely surrounded with a soft matter, resembling the brain, inclosed in thin cells, and here and there cells full of thin bloody water; the head of the thigh-bone was quite carious, as was also the acetabulum. The muscles were quite pale, and almost like boiled liver, having completely lost their fibrous appearance, and muscular properties. The same sort of morbid mischief was also found within the pelvis, most of the inside of the bones, on the affected side, being quite carious. An attempt had been made, before the patient died, to tap the bladder; but, the trocar had only entered a cell, filled with bloody water, and situated in a mass of the soft brain-like substance.

We have already said enough, to render the description of the dreadful nature of the fungus hæmatodes tolerably complete. Little can be said of the treatment; for, we know not of one medicine, that seems to have the least power of putting a stop to the disease, and we have no reason to believe, that there is ever the smallest chance even of any spontaneous amendment, much less of such a cure.

We have seen, that when the chief part of a fungus hæmatodes is cut away, and only a small portion of its cyst is left behind, that the fungus is reproduced from this part, and soon becomes as formidable, nay more formidable, than it was before, and this notwithstanding the application of the most powerful escharotics. Neither the hydrargyrus nitratus ruber, the hydrargyrus muriatus, the antimonium muriatum, nor the undiluted vitriolic acid, have always been able to repress the growth of such fungus. (*Hey.*)

There is no remedy, that has the power of checking, or removing the complaint. Friction, with anodyne balsams, sometimes gives relief in the early stages; but, it does not seem to retard the progress of the disease.

In short, the only chance of cure consists in extirpating the whole of the distempered parts, removing not only the soft, brain-like, fungous substance, but every particle of the cysts, sacs, or pouches, in which it may be contained. An operation of this kind, however, is only advisable in the early stages, while the disease is entirely local; for, after the neighbouring glands have become affected, the chance of recovery is almost destroyed. It is sometimes difficult, however, to persuade patients at this time to submit to amputation, or extirpation, because the pain and inconveniences are inconsiderable; but, the operation ought to be urged with all the force, which a conviction of its absolute necessity, and, the fatal peril of delay, ought to inspire.

The attempts to cure the disease, by cutting it away, have been attended with such ill-success, that some surgeons deem it advisable not to follow this method, but amputate the limb at once. The annexed views of the matter appear to me to be most judicious and rational. First, that if an attempt be made to cut away the tumour, and save the limb, the surgeon must be careful to remove, at the same time, a considerable quantity of the soft parts in the circumference of the swelling. Secondly, that the earlier this is done, the more likely is it to succeed. Thirdly, that, after the tumour is taken out, an attentive examination of the surface of the wound should be made, and every suspicious part, or fibre, be cut away. Fourthly, that, should the disease still recur, amputation ought to be instantly performed. Fifthly, that caustics should never be applied to this disease. Sixthly, that, even when one of these operations effectually extirpates the distemper of the limb, the patient's entire recovery is always rendered exceedingly uncertain, by reason of the viscera, and other invisible parts, being frequently affected, at the time of the operation, with the same sort of disease.

### FUNGUS HÆMATODES OF THE TESTICLE.

3. Fungus hæmatodes of the testicle sometimes begins in its glandular part, sometimes in the epididymis. Its progress is slow, and the pain generally not severe. Nor is there, at first, any inequality, or hardness, of the diseased part, nor change in the scrotum. When the testicle has become exceedingly large, it feels remarkably soft and elastic, as if it

contained a fluid. Hence, the case has often been mistaken for an hydrocele, and punctured with a trocar. (*Wardrop, and Earle in Medico-Chir. Trans. Vol.* 3, *p.* 60.) Occasionally, when the tumour is large, it is in some places hard, in others soft. The hydrocele may be known by the water beginning to collect at the bottom of the scrotum, and then ascending towards the spermatic cord, and by the swelling being circumscribed towards the abdominal ring; whereas the fungus hæmatodes begins with a gradual enlargement of the testicle itself, followed by a fulness, which extends up the spermatic cord. It is not in the slightest degree diaphanous, and is much heavier, than a similar bulk of water. (*Earle, op. cit.*) As the disease advances, abscesses form, and the scrotum ulcerates; but no fungus shoots out. When the inguinal glands become contaminated, they often acquire an immense size; and, when the skin over them bursts, large portions of them slough away. Fungus hæmatodes of the testicle is said to afflict young more frequently than old subjects. On dissection, the substance of the diseased testicle is found to present a medullary, or pulpy appearance, generally of a pale brownish colour, though sometimes red. In most cases, the tunica vaginalis and tunica albuginea are adherent together; occasionally, there is fluid between them. The only chance of a cure must be derived from a very early performance of castration, before the disease has extended to the inguinal glands, or far up the spermatic cord. Indeed, very little hope should be placed in the removal of the testicle; for, fungus hæmatodes appears to be rather a constitutional than a local disease. Nearly every case on record has terminated fatally, and, upon dissection, either the liver, the lungs, the brain, the mesenteric glands, or other internal parts, have been found affected with the same disease. (See *Cases recorded by Earle, Lawrence, and Langstaff, in Medico Chirurgical Trans. Vol.* 3.)

We shall quit this subject with stating some of the principal differences between two diseases, which have been commonly confounded. A scirrhous tumour is, from its commencement, hard, firm, and incompressible, and is composed of two substances: one hardened and fibrous, the other soft and inorganic. The fibrous matter is the most abundant, consisting of septa, which are paler than the soft substance between them. A scirrhous tumour, situated in a gland, is not capable of being separated from the latter part, so much are the two structures blended. A scirrhus, in another situation, sometimes condenses the surrounding cellular substance, so as to form a kind of capsule, and assume a circumscribed appearance. When a scirrhous swelling ulcerates, a thin ichor is discharged, and a good deal of the hard fibrous substance is destroyed by the ulceration; other parts become affected, and the patient dies from the increased ravages of the disease, and its irritation on the constitution. Sometimes, though not always, after a scirrhus has ulcerated, it emits a fungus of a very hard texture. Such excrescence, however, is itself at last destroyed by the ulceration. Cancerous sores, also, frequently put on, for a short time, an appearance in some places of cicatrization On the other hand, the fungus hæmatodes, while of moderate size, is a soft elastic swelling, with an equal surface, and a deceitful feel of fluctuation. It is, in general, quite circumscribed, being included within a capsule. The substance of the tumour, instead of being for the most part hard consists of a soft, pulpy, medullary matter, which readily mixes with water. When ulceration occurs, the tumour is not lessened by this process, as in scirrhus; but a fungus is emitted, and the whole swelling grows with increased rapidity. Cancerous diseases are mostly met with in persons of advanced age, while fungus hæmatodes generally afflicts young subjects (*Wardrop*)

In cases of external cancer, the viscera are not in general affected at the same time with cancerous disease; but, in the majority of examples of fungus hæmatodes, this distemper is found affecting in the same subject a variety of parts. In addition to the outward tumour, we find swellings of a similar nature, perhaps, in the liver, the lungs, the mesenteric glands, or even in the brain. Yet, M. Roux will have it, that cancer and fungus hæmatodes are the same disease; or, at least, that the latter is only a species of the former, and, that, in both cases, the same peculiar diathesis prevails. (*Roux, Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 216—217.)

See *Dissertations on Inflammation, by J. Burns, Vol.* 2. *Hey's Practical Observations in Surgery. Freer on Aneurism. Observations on Fungus Hematodes, or Soft Cancer, by James Wardrop, Edinb.* 1809. This last publication is highly deserving of the attention of the surgical practitioner, the disease in different organs being well described, and its character discriminated from that of cancer.

*A case of this disease is related in Vol.* 5, *of the London Medical Journal. It was the consequence of an attempt to cure a ganglion by means of a seton, and it proved fatal. A case is also related by Mr. Abernethy, in Surgical Observations,* 1804, *p.* 99. See *also a Case of diseased Testicle, accompanied with Disease of the Lungs and Brain, by H. Earle, in Medico-Chirurg. Trans. Vol.* 3, *p.* 59, *&c. in which Vol. four other cases are recorded by Mr. Lawrence, p.*

*71, et seq. and one by Mr. Langstaff, p. 277, which last I remember was shewn to me by this gentleman, a short time before the patient died. See also Voyage fait à Londres en 1814, ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p. 211, &c.*

The medullary sarcoma, which is considered by Mr. Wardrop, as the same affection as the fungus hæmatodes, is described in the article, *Tumours.*

**FURUNCULUS.** (from *furo*, to rage.) A boil, so named from the violence of the heat and inflammation attending it.

A boil is a circumscribed, very prominent, hard, deep-red, inflammatory swelling, which is exceedingly painful, and commonly terminates in a slow and imperfect suppuration. The figure of the tumour is generally that of a cone, the base of which is considerably below the surface. Upon the most elevated point of the boil, there is usually a whitish, or livid pustule, which is exquisitely sensible, and immediately beneath this is the seat of the abscess. The matter is mostly slow in forming, is seldom very abundant, never healthy, at first, being always blended with blood. The complaint is seldom attended with fever, except, when the tumour is very large, situated on a sensible part, or when several of these swellings occur at the same time in different places. In the last circumstance, they often occasion in children, and even in irritable adults, restlessness, loss of appetite, spasms, &c. They rarely exceed a pigeon's egg in size, and they may originate on any part of the body.

Boils commonly arise from constitutional causes. Young persons, and, especially subjects of full plethoric habits, are most subject to them. The disease is also observed to occur with most frequency in the spring. (*Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 16.) According to Richerand, the origin of boils depends upon a disordered state of the gastric organs. (*Nosographie Chirurgicale, Tom.* 1, *p.* 124, *Edit.* 2.)

The suppuration that attends a boil, is never perfect, and the matter which forms, is not only tinged with blood, but surrounded with a sloughy substance, which must generally be discharged, before the part affected will suppurate kindly, and the disease end. Richter compares the slough with a kind of bag, or cyst, and the whole boil with an inflamed encysted tumour.

The best plan is mostly to endeavour to make boils suppurate, as freely as possible, by applying external emollient remedies. This seems to be the natural course of the disease in its progress to a cure, and, indeed, all endeavours to discuss furunculous tumours commonly fail, or succeed very imperfectly; only removing the inflammation, and leaving behind an indolent hardness, which occasions various inconveniences, according to its situation, every now and then inflames anew, and never entirely disappears, until a free suppuration has been established.

In a very few cases, perhaps, it may be proper to try to discuss boils. For this purpose, besides bleeding, gentle evacuations, and a low diet, which are requisite in this, as well as other local inflammations, some prescribe as external applications honey strongly acidulated with sulphuric acid; alkohol; or camphorated oil.

But, in the generality of instances, suppuration must be promoted, by the use of emollient poultices. The tumour, when allowed to burst, generally does so at its apex. However, as the opening, which spontaneously occurs, is generally long in forming, and too small to allow the sloughy cellular substance to be discharged, it is always best, as soon as matter is known to exist in the tumour, to make a free opening with a lancet, and immediately afterwards to press out as much of the matter and sloughs, as can be prudently done. This having been accomplished, and the rest of the sloughs pressed out, as soon as it is practicable, healthy pus will be secreted, and the part will granulate and heal. Until the suppuration becomes of the healthy kind, and the sloughy substances are entirely discharged, an emollient linseed poultice is the best application; and when granulations begin to fill up the cavity, plain lint, and a simple pledget, are the only dressings necessary.

Where there is reason to suppose the gastric organs to be in a disordered state, an emetic should be given in the early part of the treatment, and afterwards small repeated doses of any of the mild purging salts.

When an indolent hardness continues, after the inflammatory, and suppurative state of boils has been cured, the part should be rubbed with camphorated mercurial ointment.

Besides the above *acute* boil, authors describe a *chronic* one, which is said frequently to occur, in subjects, who have suffered severely from the small-pox, measles, lues venerea, scrofula, and in constitutions, which have been injured by the use of mercury.

The *chronic* boil is commonly situated upon the extremities, is of the same size as the acute one, has a hard base, is not attended with much pain, nor any considerable discolouration of the skin, until suppuration is far advanced, and the matter is seldom quite formed before three or four weeks. This, like the former, sometimes appears in a considerable number at a time. The discharge is always thinner, than good pus, and when the boil is large, and has been long in suppurating, a great deal of sloughy cellular membrane must be cast off, before the sore will heal.

The principal thing, requisite in the local treatment of all furunculous, and carbuncular tumours, is to make an early free opening into them, and to press out the matter and sloughs, employing emollient poultices, till all the mortified parts are detached and removed, and afterwards simple dressings. (See *Pearson's Principles of Surgery. Richter's Anfangsgrunde der Wundarzn. Band.* 1. *Lassus, Pathologie Chirurgicale, Tom.* 1. *p.* 15. *Richerand Nosographie Chirurgicale, Tom.* 1, *p.* 123, *Edit.* 2.)

# G.

GANGLION, (*γαγγλιὸν.*) In surgery, a tumour on a tendon, or aponeurosis. A ganglion is an encysted, circumscribed, moveable swelling, commonly free from pain, causing no alteration in the colour of the skin, and formed upon tendons in different parts of the body, but, most frequently, upon the back of the hand, and over the wrist. A French gentleman consulted me some time ago, who had one upon the upper part of his foot, which created a great sensation of weakness in the motion of the foot, and I have taken notice, that ganglions occur particularly often just below the kneepan, in housemaids, who are in the habit of kneeling a great deal in order to scour rooms. It is curious to remark, that pressure, which is the best common means of getting rid of ganglions, in this instance, appears to act as a cause.

These tumours, when compressed, seem to possess considerable elasticity. They often occur unpreceded by any accident; frequently, they are the consequence of bruises and violent sprains. They seldom attain a considerable size, and ordinarily are not painful, though every now and then there are instances to the contrary. When opened, they are found to be filled with a viscid transparent fluid, resembling white-of-egg. If they do not disappear of themselves, or are not cured, while recent, by surgical means, they, in some cases, become so large, that they cause great inconvenience, by obstructing the motion of the part, and rendering it painful.

Discutient applications sometimes succeed in curing ganglions, and, in this country, friction with the oleum origani is a very common method. I have often seen such tumours very much lessened by this plan of treatment, but seldom cured, and, no sooner has the friction been discontinued, than the fluid in the cyst has in general accumulated again.

Compression is usually more effectual, than discutient liniments. Persons with ganglions have been recommended to rub them strongly with their thumb, several times a day. After this has been repeated very often, the tumour is said sometimes to have absolutely disappeared, while the friction was employed. But, the best method is to make continual pressure on ganglions, by means of a piece of sheet-lead, bound upon the part with a bandage. There is no objection, however, to using once, or twice a day, in conjunction with this treatment, frictions with the oleum origani, or camphorated mercurial ointment, provided these measures together do not seem likely to make the tumour inflame, an event, which should always be carefully avoided. Ganglions, when irritated too much, have been known to become most malignant diseases.

Setons have been recommended to be introduced through ganglions, with a view of curing them. This method, however, is not an eligible one, for, it is by no means free from danger, as the records of surgery fully shew. Cancerous diseases, and even the fungus hæmatodes, (*Med. Journal, Vol.* 5.) have arisen from the irritation of a seton passed through a ganglion.

Frequently, when a ganglion inflames, and ulcerates, the cyst throws out a fungus, which is of a very malignant nature. Hence, the practitioner should avoid making an opening into the swelling, or doing any thing, which is likely to occasion sloughing, or ulceration of the disease. Ganglions may be cured by pressure, of such force, as to rupture the cyst, and some authors have recommended putting the hand affected upon a table, and then striking the ganglion several times with the fist, or a mallet. The cyst of a recent ganglion may also be burst, by compressing it strongly with the thumbs, with or without the intervention of a piece of money; the fluid is effused into the adjacent cellular membrane; and, pressure being now employed, the opposite sides of the cavity become united by the adhesive inflammation, and the recurrence of the disease is prevented. (See *L'Encyclopedie Méthodique, Partie Chirurgicale, art. Ganglion; Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 400, *&c.*; *Leveillé, Nouvelle Doctrine Chirurgicale, Tom.* 3, *p.* 7.)

In almost every instance, a ganglion

may be cured by pressure and friction, and, if not actually cured, the disease may be rendered so bearable by these means, that few patients would choose to have the tumour cut out. Under this plan, the swelling becomes very much diminished, and, should it enlarge again, the mode of relief is so simple, and the case so little troublesome, that patients generally content themselves with every now and then wearing a piece of lead on the part.

But when ganglions resist all attempts to disperse, or palliate them; when they become extremely inconvenient, either by obstructing the functions of a joint, or causing pain; these tumours should be carefully dissected out, by first making a longitudinal incision in the skin covering them, then separating the cyst on every side from the contiguous parts, and lastly cutting every particle of it off the subjacent tendon, or fascia. The greatest care must be taken, not to make any opening in the cyst, so as to let out its contents, and make it collapse; a circumstance, which would render the dissection of it entirely out much more difficult.

The operation being accomplished, the skin is to be brought together with sticking plaster, and a compress placed over the situation of the tumour, with a view of healing the wound and the cavity by adhesion.

When the ganglion has burst, or is ulcerated, it is best to remove the diseased skin, together with the cyst, and of course the incision must be oval, or circular, as may seem most convenient. The grand object is not to allow any particle of the cyst to remain behind, as it would be very likely to throw out a fungus, and prevent a cure. In Warner's Cases of Surgery is an account of two considerable ganglions, which this gentleman thought it right to extirpate. These had become adherent to the tendons of the fingers. In the operation, he was obliged to cut the transverse ligament of the wrist, and the patients, who before could not shut their hands, nor close their fingers, perfectly regained the use of these parts. Mr. Gooch relates a case of the same kind, which had been occasioned by a violent bruise, three, or four, years before. The tumour reached from the wrist to the middle of the hand, and created a great deal of pain. Mr. Gooch extirpated it, and then restored the position of the hand, and free motion of the joint, by the use of emollient applications, and suitable pressure, made with a machine constructed for the purpose. Other cases, confirming the safety of cutting out ganglions, are recorded in the London Medical Journal for 1787, p. 154; and by Eller, in Mém. de l'Acad. des Sciences de Berlin, Tom. 2, ann. 1746.

The ganglions, which occur just below the knee, I have seen cured by a little blister, applied over them, and kept open with the savin cerate.

For information, relative to ganglions, consult *Warner's Cases in Surgery. Chirurgical Works of B. Gooch, Vol. 2, p. 376. Heister's Surgery. B. Bell's Surgery. Latta's System of Surgery. L'Encyclopédie Méthodique; Partie Chirurgicale; art. Ganglion. Richter's Anfangsgrunde der Wundarzneykunst, Band.* 1. *Lassus, Pathologie Chirurgicale, Tom.* 1. *p.* 399.

**GANGRENE.** (from γαινω, to feed upon.) An incipient mortification, so named from its eating away the flesh.

Authors have generally distinguished mortification into two stages; the first, or incipient one, they name *gangrene*, which is attended with a sudden diminution of pain in the place affected; a livid discolouration of the part, which from being yellowish, becomes of a greenish hue; a detachment of the cuticle, under which a turbid fluid is effused; lastly, the swelling, tension, and hardness, of the previous inflammation, subside, and, on touching the part, a crepitus is perceptible, owing to the generation of air in the gangrenous parts.

Such is the state, to which the term *gangrene* is applied.

When the part has become quite cold, black, fibrous, incapable of moving, and destitute of all feeling, circulation, and life; this is the second stage of mortification, termed *sphacelus*. Gangrene, however, is frequently used synonymously with the word mortification. (See *Mortification.*)

**GASTROCELE.** (from γαϛηϱ, the stomach, and ϰηλη, a tumour.) A hernia of the stomach.

**GASTRORAPHIA,** or GASTRORAPHE. (from γαϛηϱ, the belly, and ϱαφη, a suture.) A suture of the belly, or some of its contents.

Although the term *gastroraphe*, in strictness of etymology, signifies no more, than sewing up any wound of the belly, yet Mr. Samuel Sharp informs us, that, in his time, the word implied, that the wound of the abdomen was complicated with another of the bowels.

The moderns, I think, seem to limit the meaning of the word to the operation of sewing up a wound of the parietes of the abdomen.

What was formerly meant by gastroraphe could scarcely ever be practised, because the symptoms laid down for distinguishing when an intestine is wounded, do not with any certainty determine in what particular part it is wounded; which want of information, makes it absurd to open the abdomen in order to get at it. Hence, the operation of stitching the bowels can only take place, when they fall out of the abdomen, and when we can see where the wound is situated.

The circumstances, making the practice of sewing up a wounded intestine proper, are so rare, that Du Verney, who was the most eminent surgeon in the French army a great many years during the wars, and fashion of duelling, declared, he never had once an opportunity of practising the gastroraphe, according to the former acceptation of that word.

Upon the supposition of the intestine being wounded in such a manner as to require the operation, Mr. Sharp advises taking a straight needle with a small thread, laying hold of the bowel with your left hand, and sewing up the wound with the glover's stitch, that is, by passing the needle through the lips of the wound from within outwards all the way, so as to leave a length of thread at both ends, which are to hang out of the incision of the abdomen. He then directs you carefully to make the interrupted suture of the external wound, and to pull the bowel by the small threads into contact with the peritoneum, for the more readily uniting with it afterwards by adhesion; though he seems to think it would be more secure to pass the threads with the straight needle through the lower edges of the wound of the abdomen, which would more certainly hold the intestine in that situation. In about six days, the ligature of the intestine will be loose enough to be drawn away; in the interim, superficial dressings are to be applied, and the patient kept on low diet. (*Sharp.*)

On this operation, we have only to remark, that as the only use of a suture of the bowel is to keep the wound of it near the external wound, in case any extravasation should occur, this object can be as effectually accomplished by one fine stitch, as by sewing up all the breach of the intestine, and without being so likely to excite inflammation of the parts. We shall add no more concerning sutures of the bowels, to what is contained in the articles *Hernia*, and *Wounds of the Abdomen.*

Gastroraphe, or merely sewing up a wound of the parietes of the abdomen, may be done, as Mr. Sharp explains, with the common interrupted suture, (see *Suture*) or with the quilled one, which is better, as follows:

A ligature, capable of splitting into two, has a needle attached to each end of it. The operator is to put the index finger of his left hand into the wound, under the lip furthest from him. This finger is in contact with the peritoneum, in order that it may with the thumb pinch up, and raise the whole thickness of the parietes. With the other hand, one of the needles is to be introduced into the abdomen, guiding its point on the index finger, in order to avoid wounding the omentum, or intestines. The lip of the wound is to be pierced, from within outward, about an inch from its edge. The other needle is to be passed in the same way through the opposite lip. Then the two needles are to be cut off. As many such sutures must be made, as the extent of the wound may require.

The sides of the wound are next to be brought together, and we are to prepare to tie the ligatures, not in a bow, in the way of the interrupted suture, because the continual action of the abdominal muscles might make the ligatures cut their way through the parts. It is better, to divide each end of the ligatures into two portions, and to tie these over a piece of bougie laid along the line at which the ligatures emerge from the flesh. This is to be done to all the ligatures on one side first. Then the wound being closed, another piece of bougie is to be placed along the other lip of the wound, and the opposite ligatures tied over it, with sufficient tightness, to keep the sides of the wound in contact. This suture is certainly preferable to the interrupted one, because a great deal of its pressure is made on the two pieces of bougie, and of course it is less likely to cut its way out. Its operation is to be assisted with compresses laid over each side of the wound, and the uniting bandage. Every thing, that puts the abdominal muscles into action, drags the suture, irritates the wound, and creates a risk of the threads cutting their way through the part, in which they are introduced; consequently, it must be avoided. To prevent, as much as possible, the exertion of the muscles, the bowels should be kept open with clysters; and opium is the best thing for putting a stop to the vomiting, sometimes attendant on wounds of the abdomen, and producing very injurious effects, in regard to the wound.

In about a week, the sutures may generally be removed, and sticking plaster alone employed. As to what more relates to these particular cases, we must refer to *Wounds of the Abdomen.*

It is generally allowed, that sutures are violent means, to which we should only resort, when it is impossible to keep the lips of a wound in contact by the observance of a proper posture, and the aid of a methodical bandage. M. Pibrac believes such circumstances exceedingly uncommon, and in his excellent production, in the third volume of the Memoirs of the Royal Academy of Surgery, relative to the abuse of sutures, cases are related, which fully prove, that wounds of the belly readily unite by means of a suitable posture and a proper bandage, without having recourse to gastroraphe. These, however, are less decisive and convincing, (if possible to be so) than the relations of the Cæsarean operation, the extensive wound of which has oftentimes been healed by these simple means, after the failure of sutures. It is not only possible to dispense with gastroraphe in the treatment of wounds of the abdomen, it has even been manifested, that this operation has sometimes occasioned very bad symptoms.

Under certain circumstances, however, it may be essentially necessary to practise gastroraphe. For instance, were a large wound to be made across the parietes of the abdomen, a suture might become indispensably requisite, to prevent a protrusion of the bowels. Yet, even in this case, the sutures should be as few in number as possible.

A bandage of the eighteen-tailed kind, might prove very useful in a longitudinal wound of the abdomen, and do away all occasion for gastroraphe. (See *Sutures.*)

We shall conclude this article with a fact, perhaps, more curious, than instructive, related by M. Bordier, of Pondicherry, in the *Journal de Medecine*, vol. 26. 538. An Indian soldier, angry with his wife, killed her, and attempted to destroy himself by giving himself a wound with a broad kind of dagger in the abdomen, which caused a protrusion of the bowels. A doctor of the country, being sent for, dissected between the muscles and skin, and introduced there a thin piece of lead, which kept up the bowels. The wound soon healed up, the lead having produced no inconvenience. The man was afterwards hung, and M. Bordier, when the body was opened, assured himself more particularly of the fact. Indeed, numerous cases prove, that lead may lodge in the living body, without occasioning the inconvenience, which results from the presence of almost any other kind of extraneous body.

See *Le Dran's Opérations de Chirurgie. Sharp's Treatise on the Operations of Surgery. L'Encyclopédie Méthodique; Partie Chirurgicale, art. Gastroraphe; La Medecine Operatoire par Sabatier, Tom.* 1.

**GASTROTOMIA.** (from γαςηρ, the belly, and τεμνω, to cut.) The operation of opening the abdomen and uterus. The Cæsarean operation. It also signifies opening the abdomen for other purposes.

**GLAUCOMA.** (from γλαυκος, blue.) A disease of the eye, in which the crystalline lens becomes of a blue, or sea-green colour. The exact meaning of this ancient term, however, is very undetermined; some say it is a disease of the crystalline; others, that it is an affection of the vitreous humour. Galen in his book *de usu partium* imputes glaucoma to a morbid dryness of the crystalline; in which sentiment he has been followed by Ætius, and Maître-Jan, at the commencement of the 18th century. Since, however, the cataract has been decidedly ascertained to depend upon a disease of the crystalline; the term glaucoma, has been reserved for an opacity of the vitreous humour, as we may learn from Heister, Platner, and all the oculists, who published about the middle of the last century. Lancisi mentions, that he once found the vitreous humour cartilaginous; and Morand has seen it converted into a stony substance. These instances, and some others, are in favour of the opinion, that glaucoma, may arise from an opacity of the vitreous humour. A glaucoma, even of a confirmed kind, cannot always be easily distinguished from a cataract, especially, while the latter is in an incipient state. It is said, however, that suspicions of the disease may be entertained, when the unnatural colour, which characterizes it, is reflected from a deep surface, behind the pupil; whereas the opacity of a cataract is more superficial, and nearer to the margin of the uvea.

Glaucoma is certainly an exceedingly uncommon disease. Authors recommend applying blisters, and giving internally the extract of cicuta, calomel, and soap. (*Encyclopédie Méthodique; Partie Chir.*) The topical use of æther may also be tried, which we have mentioned, as one of Mr. Ware's remedies for promoting the absorption of cataracts.

From our present knowledge of the power of the absorbents to remove opaque substances in the eye, when such are detached and loose, as they actually become after being disturbed with a couching needle, there can be no doubt that, if an opacity of a part of the vitreous humour were to present itself in practice, and not yield to the above means, it would be justifiable conduct, on the part of the surgeon, to endeavour to move such opacity out of the axis of sight, and, at all events, to disturb it so freely with a couching needle, as to afford a chance of its being absorbed.

**GLAUCOSIS,** same as *Glaucoma.*

**GLEET.** By the term *gleet*, we commonly understand a continued running, or discharge, after the inflammatory symptoms of a clap for some time have ceased, being unattended with pain, scalding in making water, &c. Mr. Hunter remarks, that it differs from a gonorrhœa in being uninfectious, and in the discharge consisting of globular bodies, contained in a slimy mucus, instead of serum. He says, that a gleet seems to take its rise from a habit of action, which the parts have contracted. The disease, however, sometimes stops of itself, even after every method has been ineffectually tried. This probably depends upon accidental changes in the constitution, and not at all upon the nature of the disease itself. Mr. Hunter suspected some gleets were connected with scrophula. The sea-bath cures more gleets, than the common cold bath, or any other mode of bathing. An injection of diluted sea-water cures some gleets, though it is not always effectual.

Gleets are often attended with a relaxed constitution. They also sometimes arise from other affections of the urethra, besides gonorrhœas. A stricture is almost always attended with a gleet; so sometimes is disease of the prostate gland.

When a gleet, observes Mr. Hunter, does not arise from any evident cause, nor can be supposed to be a return of a former gleet, in consequence of a gonorrhœa, either a stricture or diseased prostate gland is to be suspected; an enquiry should be made whether the stream of urine is smaller than common, whether there be any difficulty in voiding it, and whether the calls to make it are frequent. If there should be such symptom, a bougie, rather under the common size, should be introduced; and, if it passes on to the bladder with tolerable ease, the disease is probably in the prostate gland, which should next be examined. (See *Urethra, Strictures of; and Prostate Gland, Diseased.*)

Balsams, turpentines, and cantharides, given internally, are of use, especially in slight cases; and when they are useful, prove so almost immediately. Hence, if they neither lessen nor remove the gleet in five or six days, Mr. Hunter never continued them longer. As the discharge, when removed, is also apt to recur, such medicines should be continued for some time after the symptoms have disappeared.

The cold bath, sea-bath, bark and steel, may be given when the whole constitution is weak. The astringent gums, and salt of steel, given as internal astringents, have little power.

With regard to local applications, the astringents commonly used are, the decoction of bark, white vitriol, alum and preparations of lead. The aqua vitriolica, cærulea, of the London Dispensatory, diluted with eight times its quantity of water, makes a very good injection.

Irritating applications are, either injections, or bougies, simple or medicated with irritating medicines. Violent exercise may be considered as having the same effect. Such applications should never be used till the other methods have been fully tried, and found unsuccessful. They at first increase the discharge. Two grains of the hydrargyrus muriatus, in eight ounces of water, are a very good irritating injection. In irritable habits, such an application may do great harm, and the capability of the parts to bear its employment, should first be made out, if possible.

Bougies sometimes act violently, and are more efficacious than injections. A simple unmedicated one is generally sufficient, and must be used a month or six weeks, before the cure can be depended upon. Those medicated with camphor, or turpentine, need not be used so long. The size of the bougie should be under the common.

Mr. Hunter has known a gleet disappear on the breaking out of two chancres on the glans. Gleets have also been cured by a blister on the under-side of the urethra; and, by electricity.

In every plan of cure, rest, or quietness, is generally of great consequence; but, after the failure of the usual modes, riding on horseback has immediately effected a cure.

Regularity and moderation in diet are to be observed.

Intercourse with women often causes a return, or increase of gleet; and, in such cases, it gives suspicion of a fresh infection; but the difference between this and a fresh infection is, that here the return is almost immediately after the connexion.

Gleets in women, are cured like those of men. Turpentines, however, have no specific effect on the vagina. The astringent injections may also be stronger, than those for men.

See *A Treatise on the Venereal Disease, by John Hunter. Also, Swediaur's Practical Observations on Venereal Complaints.*

**GLOSSOCATOCHUS.** (from γλωσσα, the tongue; and κατεχω, to depress.) The ancient glossocatochus was a sort of forceps, one of the blades of which served to depress the tongue, while the other was applied under the chin.

**GOITRE.** See *Bronchocele.*

**GONORRHŒA,** (from γονη, the semen; and ϱεω, to flow.) Etymologically, an involuntary discharge of the semen; but always, according to modern surgery, a discharge of a purulent infectious matter, from the urethra in the male, and from the vagina and surfaces of the labiæ, nymphæ, clitoris, &c. in the female subject.

This disease occurs, in Latin authors, under the different denominations of *gonorrhœa, G. Virulenta, Fluor albus malignus.* Dr. Swediaur, after censuring the etymological import, as conveying an erroneous idea, says, if a Greek name is to be retained, he would call it blennorrhagia, from βλεννα, mucus, and ϱεω, to flow. However, as most moderns consider the discharge as pus, not mucus, the etymological import of blennorrhæa is as objectionable as that of gonorrhœa. In English, the disease is commonly called a *clap*, from the old French word *clapises*, which were public shops, kept and inhabited by single prostitutes, and generally confined to a particular quarter of the town, as is even now the case in several of the great towns in Italy. In German, the disorder is named a *tripper*, from dripping; and in French, a *chaudepisse*, from the heat and scalding in making water. (*Swediaur.*)

We shall first present the reader with some of Mr. Hunter's opinions, concerning the nature of gonorrhœa, its symptoms, and treatment; and, lastly, take notice of the observations of some other writers.

When an irritating matter of any kind is applied to a secreting surface, it increases that secretion, and changes it from its natural state to some other. In the present instance, it is changed from mucus to pus.

Till about the year 1753, it was generally supposed, that the matter from the urethra, in a gonorrhœa, arose from ulcers in the passage; but about that time, it was ascertained, that pus could be secreted without a breach of substance. It was first accidentally proved, by dissection, that pus could be formed in the bag of the pleura, without ulceration; and Mr. Hunter afterwards examined the urethra of malefactors and others, who were executed, or died, while known to be affected with gonorrhœa, and demonstrated that the canal was entirely free from every appearance of ulcer.

The time, when a gonorrhœa first appears, after infection, is extremely various. It generally comes on sooner, than a chancre. Mr. Hunter has had reason to believe, that, in some instances, the disease has begun in a few hours, while, in others, six weeks have previously elapsed; but he has known it begin at all the intermediate periods. About six, eight, ten, or twelve days, however, after infection, is the most common period.

The surface of the urethra is subject to inflammation and suppuration, from various other causes besides the venereal poison; and sometimes discharges happen spontaneously, when no immediate cause can be assigned. Such may be called *simple* gonorrhœa, having nothing of the venereal infection in them.

Mr. Hunter has known the urethra sympathize with the cutting of a tooth, and produce all the symptoms of a gonorrhœa. This happened several times to the same patient. The urethra is known to be sometimes the seat of the gout; Mr. Hunter has known it to be the seat of rheumatism.

When a secreting surface has once received the inflammatory action, its secretions are increased and visibly altered. Also, when the irritation has produced inflammation, and an ulcer in the solid parts, a secretion of matter takes place, the intention of which, in both, seems to be to wash away the irritating matter. But, in inflammations, arising from specific, or morbid poisons, the irritation cannot be thus got rid of; for, although the first irritating matter be washed away, yet, the new matter formed has the same quality as the original had; and therefore, upon the same principle, it would produce a perpetual source of irritations, even if the venereal inflammation, like many other specific diseases, were not what it really is, kept up by the specific quality of the inflammation itself. This inflammation seems, however, to be only capable of lasting a limited time, the symptoms peculiar to it vanishing of themselves, by the parts becoming less and less susceptible of irritation. The consequent venereal matter can have no power of continuing the original irritation, otherwise there would be no end to the disease. The time, which the susceptibility of the irritation lasts, must depend upon the difference in the constitution, and not upon any difference in the poison itself.

The venereal disease only ceases spontaneously, when it attacks a secreting surface, and produces a mere secretion of pus, without ulceration.

### SYMPTOMS OF GONORRHŒA.

The first symptom is generally an itching at the orifice of the urethra, sometimes extending over the whole glans. A little fulness of the lips of the urethra, the effect of inflammation, is next observable, and soon afterwards a running appears.

The itching changes into pain, more particularly at the time of voiding the urine. There is often no pain till some time after the appearance of the discharge, and other symptoms; and in many gonorrhœas, there is hardly any pain at all, even when the discharge is very considerable. At other times, a great degree of soreness occurs long before any discharge appears. There is generally, at this time, a particular fulness in the penis, and more especially in the glans. The glans has also a kind of transparency, especially near the beginning of the urethra, where the skin, being distended, smooth, and red, resembles a ripe cherry. The mouth of the urethra is, in many instances, evidently excoriated. The surface of the glans itself is often in a half-excoriated state, consequently very tender; and it secretes a sort of discharge. The canal of the urethra becomes narrower, which is known by the stream of urine being smaller than common. This proceeds from the fulness of the penis in general, and from the lining of the urethra being swollen, and in a spasmodic state. The fear of the patient, while voiding his urine, also disposes the urethra to contract. The stream of urine is generally much scattered and broken, as soon as it leaves the passage. There is frequently some degree of hemorrhage from the urethra, perhaps, from the distention of the vessels, more especially when there is a chordee, or a tendency to one. Small swellings often occur, along the lower surface of the penis, in the course of the urethra These, Mr. Hunter suspected to be enlarged glands of the passage. They occasionally suppurate, and burst outwardly, but now and then in the urethra itself. Mr. Hunter has also suspected such tumours to be ducts, or lacunæ of the glands of the urethra distended with mucus, in consequence of the mouth of the duct being closed, in a manner similar to what happens to the duct leading from the lachrymal sac to the nose, and so as to induce inflammation, suppuration, and ulceration. Hardness and swelling have also occurred in the situation of Cowper's glands, and ended in considerable abscesses in the perineum. The latter tumours break either internally or externally, and sometimes in both ways, so as to produce fistulæ in perinæo.

A soreness is often felt all along the under side of the penis, frequently extending as far as the anus. The pain is particularly great in erections; but the case differs from chordee, the penis remaining straight.—Erections are frequent in most gonorrhœas, and even sometimes threaten to bring on mortification. As opium is of great service, Mr. Hunter thinks there is reason to suppose them of a spasmodic nature.

The natural slimy discharge from the glands of the urethra is first changed, from a fine transparent ropy secretion, to a watery whitish fluid; and the lubricating fluid, which the passage naturally exhales, becomes less transparent; both these secretions becoming gradually thicker, assume more and more the qualities of common pus.

The matter of gonorrhœa, often changes its colour and consistence, sometimes from a white to a yellow, and often to a greenish colour. These changes depend on the increase and decrease of the inflammation, and not on the poisonous quality of the matter itself; for, any irritation of these parts, equal to that produced in a gonorrhœa, will produce the same appearances.

The discharge is produced from the membrane lining the urethra, and from the lacunæ, but, in general, only for about two or three inches* from the external orifice. Whenever Mr. Hunter had an opportunity of examining the urethra affected with gonorrhœa, he always found the lacunæ loaded with matter, and more visible than in the natural state. Before the time of this celebrated man, it was commonly supposed, that the discharge arose from the whole surface of the urethra, and even from Cowper's glands, the prostate and vesiculæ seminales.

But, if the matter were secreted from all these parts, the pus would collect in the bulb, as the semen does, and thence be emitted in jerks; for, nothing can be in the bulbous part of the urethra, without stimulating it to action, especially, when in a state of irritation and inflammation.

When the inflammation is violent, some of the vessels of the urethra often burst, and a discharge of blood ensues. Sometimes such blood is only just enough to give the matter a tinge. The erections often stretch the part so much as to cause an extravasation.

When the inflammation goes more deeply than the membranous lining, and affects the reticular membrane of the urethra, it produces in it an extravasation of coagulable lymph, the consequence of which is a chordee. (See *Chordee.*)

Mr. Hunter suspected, that the disease is communicated or creeps along from the glans to the urethra, or, at least, from the lips of the urethra to its inner surface, as it is impossible, that the infectious matter can, during coition, get as far as the disease extends. He mentions an instance, in which a gentleman, who had not cohabited with any woman for many weeks, to all appearances caught a gonorrhœa from a piece of plaster, which had adhered to his glans penis, in a necessary abroad, and which is accounted for by supposing that some person, with a clap, had previously been to this place, and had left behind some of the discharge, and that the above gentleman had allowed his penis to remain in contact with the matter, till it had dried.

Many symptoms, depending on the sympathy of other parts with the urethra, sometimes accompany a gonorrhœa. An uneasiness, partaking of soreness and pain, and a kind of weariness, are every where felt about the pelvis. The scrotum, testicles, perinæum, anus, and hips, become disagreeably sensible to the patient, and the testicles often require to be suspended. So irritable, indeed, are they in such cases, that the least accident, or even exercise, which would have no such effect at another time, will make them swell.

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* P. 50. Mr. Hunter says, seldom further than an inch and a half, or two inches at most. This he terms the specific extent of the inflammation.

The glands of the groin are often affected sympathetically, and even swell a little, but do not suppurate, as they generally do when they inflame from the absorption of matter. Mr. Hunter has seen the irritation of a gonorrhœa so extensive as to affect with real pain the thighs, buttocks, and abdominal muscles. He knew one gentleman, who never had a gonorrhœa without being immediately seized with universal rheumatic pains.

When the gonorrhœa, exclusive of the affections arising from sympathy, is not more violent than has been described, it may be called a *common*, or *simple venereal one*; but, if the patient is very susceptible of such irritation, or of any other mode of action which may accompany the venereal, then the symptoms are in proportion more violent. In such circumstances, we sometimes find the irritation and inflammation exceed the specific distance, and extend through the whole urethra. There is often a considerable degree of pain in the perinæum; and a frequent, though not a constant symptom, is a spasmodic contraction of the acceleratores urinæ, and erectores muscles. The inflammation, in these cases, is sometimes considerable, and goes deeply into the cellular membrane, without producing any effect, however, except swelling. In other instances, it goes on to suppuration, often becoming one of the causes of fistulæ in perinæo. Cowper's glands may hence suppurate, and the irritation is often extended even to the bladder itself.

When the bladder is affected, it becomes more susceptible of every kind of irritation. It will not bear the usual distention, and, therefore, the patient cannot retain his water the ordinary time, and the moment the desire of making water takes place, he is obliged instantly to make it, with violent pain in the bladder, and still more in the glans penis, exactly similar to what happens in a fit of the stone. If the bladder be not allowed to discharge its contents immediately, the pain becomes almost intolerable; and even when the water is evacuated, there remains, for some time, a considerable pain, both in the bladder and glans.

The ureters, and even the kidneys, sometimes, though rarely, sympathize, when the bladder is much affected. Mr. Hunter had reason to suspect, that the irritation may be communicated to the peritonæum, by means of the vas deferens.

Mr. Hunter mentions a case in which, when the inflammatory symptoms of a gonorrhœa were abating, an incontinence of urine came on; but, in time, got spontaneously well.

A very common symptom, attending a gonorrhœa, is a swelling of the testicle. See *Hernia Humoralis.*

Another occasional consequence of a gonorrhœa, is a sympathetic swelling of the inguinal glands. (See *Bubo.*)

A hard chord is sometimes observed, leading from the prepuce along the back of the penis, and often directing its course to one of the groins, and affecting the glands. There is most commonly a swelling in the prepuce, at the part where the chord takes its rise. This sometimes happens when an excoriation and a discharge from the prepuce, or glans penis exist.

From the above account, the symptoms of gonorrhœa, in different cases, seem to be subject to infinite variety. The discharge often appears without any pain; and the coming on of the pain is not at any stated time after the appearance of the discharge. There is often no pain at all, although the discharge is in considerable quantity, and of a bad appearance. The pain often goes off, while the discharge continues, and will return again. An itching, in some cases, is felt for a considerable time, which is sometimes succeeded by pain; though, in many cases, it continues to the end of the disease. On the other hand, the pain is often troublesome, and considerable, even when there is little or no discharge. In general, the inflammation in the urethra does not extend beyond an inch or two from the orifice; sometimes it runs all along the urethra to the bladder, and even to the kidneys, and, in some cases, spreads into the substance of the urethra, producing a chordee. The glands of the urethra inflame, and often suppurate; and Mr. Hunter suspected that Cowper's glands sometimes do the same. The neighbouring parts sympathize, as the glands of the groin, the testicle, the loins, and pubes, with the upper parts of the thighs, and abdominal muscles. Sometimes the disease appears a few hours after the application of the poison; sometimes six weeks elapse first. It is often impossible to determine whether the case is a venereal or only an accidental discharge, arising from some unknown cause.

### GONORRHŒA IN WOMEN.

The disorder is not so easily ascertained in them as in men, because they are subject to a disorder called *fluor albus*, which resembles gonorrhœa. A discharge simply from women, is less a proof of the existence of a gonorrhœa, than even a discharge without pain in men. The kind of matter does not enable us to distinguish a gonorrhœa from a fluor albus; for the discharge in the latter affection often puts on all the appearance of venereal matter. Pain is not necessarily present, and therefore forms no line of distinction. The appearance of the parts often gives us but little information; for, continues Hunter, I have frequently examined the parts of those who confessed all the symptoms, such as increase of discharge, pain in making water, soreness in walking, or when the parts were touched, yet I could see no difference between these and sound parts. I know of no other way of judging, in cases where there are no symptoms sensible to the person herself, or where the patient has a mind to deny any uncommon symptoms, but from the circumstances preceding the discharge; such as her having been connected with men supposed to be unsound, or her being able to give the disorder to others; which last circumstance being derived from the testimony of another person, is not always to be trusted to, for obvious reasons.

From the manner, in which the disease is contracted, it must principally attack the vagina, a part not endowed with much sensation. In many cases, however, it produces a considerable soreness on the inside of the labia, nymphæ, clitoris, carunculæ myrtiformes, and meatus urinarius. Those parts are so sore, in some cases, as not to bear being touched; the person can hardly walk; the urine gives pain in its passage through the urethra, and when it comes into contact with the above-mentioned parts.

The bladder sometimes sympathizes, and even the kidneys. The mucous glands, on the inside of the labia, often swell, and sometimes suppurate, forming small abscesses, which open near the orifice of the vagina.

Mr. Hunter states, that the venereal matter from the vagina sometimes runs down the perinæum to the anus, and produces a gonorrhœa, or chancre, in that situation. The disease in women may probably wear itself out, as in men; but it may exist in the vagina for years, if the testimony of patients can be relied on.

### TREATMENT OF GONORRHŒA.

As every form of the venereal disease arises from the same cause, and as we have a specific for some forms, we might expect that this would be a certain cure for every one; and, therefore, that it must be no difficult task to cure the disease, when in the form of inflammation and suppuration in the urethra. Experience, however, teaches us, that the gonorrhœa is the most variable in its symptoms, while under a cure; and the most uncertain, with respect to its cure, of any forms of the venereal disease; many cases terminating in a week, while others continue for months, under the same treatment.

The only curative object is, to destroy the disposition and specific mode of action in the solids of the parts, and as they become changed, the poisonous quality of the matter produced will also be destroyed. This effects the cure of the disease, but not always of the consequences.

This form of the disease is not capable of being continued beyond a certain time in any constitution; and when it is violent, or of long duration, it is owing to the part being very susceptible of such irritation, and readily retaining it. As we have no specific remedy for the gonorrhœa, it is fortunate that time alone will effect a cure. It is worthy of consideration, however, whether medicine can be of any service. Mr. Hunter is inclined to think it not of the least use, in nine cases out of ten. But even this would be of some consequence, if the cases capable of being benefited could be distinguished.

The means of cure, generally adopted, are of two kinds, internal remedies, and local applications; but, whatever plan is pursued, we are always to attend more to the nature of the constitution, or to any attending disease in the parts themselves, or parts connected with them, than to the gonorrhœa itself.

When the symptoms are violent, but of the common inflammatory kind, known from the extent of the inflammation not exceeding the specific distance, the local treatment may be either irritating or soothing.

Irritating applications, in these cases, are less dangerous, than when there exists irritable inflammation, and they may alter the specific action; but, to produce this effect, their irritation must be greater, than that of the original injury. The parts will afterwards recover of themselves, as from any other common inflammation.

Mr. Hunter believes, however, that the soothing plan is the best at the beginning. If the inflammation be great, and of the irritable kind, no violence is to be used, for it would only increase the symptoms; nothing should be done that may tend to stop the discharge, as doing so would not put a stop to the inflammation. The constitution is to be altered, if possible, by remedies adapted to each disposition, with a view of altering the actions of the parts arising from such disposition, and reducing the disease to its simple form. If the constitution cannot be altered, nothing is to be done, and the action is to be allowed to wear itself out.

When the inflammation has abated, the cure may be attempted by internal remedies, or local applications, not operating violently, which might re-produce the irritation. Gentle astringents may be applied.

But, if the disease has begun mildly, an irritating injection may be used, in order quickly to get rid of the specific mode of action. This application will increase the symptoms for a time; but, when it is left off, they will often abate, or wholly disappear. In such a state of parts, astringents may be used, the discharge being now the only thing to be removed.

When itching, pain, and other uncommon sensations are felt for some time before the discharge appears, Mr. Hunter diffidently expresses his inclination to recommend the soothing plan, instead of the irritating one, in order to bring on the discharge, which is a step towards the resolution of the irritation; and he adds, that to use astringents would be bad practice, as, by retarding the discharge, they would protract the cure. When there are strictures, or swelled testicles, astringents should not be used; for, while there is a discharge, such complaints are relieved.

Mr. Hunter thus expresses himself in regard to the effect of mercury in gonorrhœa: "I doubt very much of mercury having any specific virtue in this species of the disease; for I find that it is as soon cured without mercury as with it, &c. So little effect, indeed, has this medicine upon a gonorrhœa, that I have known a gonorrhœa take place while (the patient was) under a course of mercury, sufficient for the cure of a chancre. Men have also been known to contract a gonorrhœa when loaded with mercury for the cure of a lues venerea; the gonorrhœa, nevertheless, has been as difficult of cure as in ordinary cases."

Mr. Hunter does not say much in favour of evacuants, diuretics, and astringents, given internally. He allows, however, that astringents which act specifically on the parts, as the balsams, conjoined with any other medicine, which may be thought right, may help to lessen the discharge, in proportion as the inflammation abates.

Local applications may be either internal to the urethra, external to the penis, or both. Those which are applied to the urethra seem to promise most efficacy, because they come into immediate contact with the diseased parts. They may be either in a solid or fluid form. A fluid is only a very temporary application. The solid ones, or bougies, may remain a long while, but in general irritate immediately, from their solidity alone; and, Mr. Hunter says, the less bougies are used, when the parts are in an inflamed state, the better, though he never saw any bad effects from them, when applied with caution.

The fluid applications, or injections, in use, are innumerable; and as gonorrhœas frequently get well with so many of various kinds, we may infer, that such complaints would, in time, get well of themselves. Injections, however, certainly often have an immediate effect on the symptoms, and hence must have power; though the one which possesses the greatest specific power is unknown. As injections are only temporary applications, they must be used often, especially when found useful, and they are not of an irritating kind.

Mr. Hunter divides injections into four kinds, the *irritating*, *sedative*, *emollient*, and *astringent*.

Irritating injections, of whatever kind, act in this disease upon the same principle; that is, by producing an irritation of another kind, which ought to be greater than the venereal; by which means the venereal is destroyed and lost, and the disease cured, although the pain and discharge may still be kept up by the injection. Those effects, however, will soon go off, when the injection is laid aside. In this way bougies also perform a cure. Most of the irritating injections have an astringent effect, and prove simply astringent when mild.

Irritating injections should never be used when there is already much inflammation; especially, in constitutions, which are known to be incapable of bearing much irritation; nor should they be used when the inflammation has spread beyond the specific distance; nor when the testicles are tender; nor when, upon the discharge ceasing quickly, these parts have become sore; nor when the perinæum is very susceptible of inflammation, and especially if it formerly should have suppurated; nor when there is a tendency in the bladder to irritation, known by the frequency of making water.

In mild cases, and in constitutions which are not irritable, such injections often succeed, and remove the disease almost immediately. The practice, however, ought to be attempted with caution, and not, perhaps, till milder methods have failed. Two grains of the hydrargyrus muriatus, dissolved in eight ounces of distilled water, form a very good irritating injection; but an injection of only half this strength may be used, when it is not intended to attempt a cure so quickly. If however, the injection, even in that proportion, gives considerable pain in its application, or occasions a great increase of pain in making water, it should be diluted.

Sedative injections will always be of service, when the inflammation is considerable, and they are very useful in relieving the pain. Perhaps, the best sedative is opium, as well when given by the mouth, or anus, as when applied to the part affected, in the form of an injection. But, even opium will not act as a sedative in all constitutions, and parts; but, on the contrary, often has opposite effects, producing great irritability. Lead may be reckoned a sedative, so far as it abates inflammation, while, at the same time, it may act as a gentle astringent. Fourteen grains of saccharum saturni, in ℥viij of distilled water, make a good sedative astringent injection.

Drinking freely of diluting liquors may, perhaps, have a sedative effect, as it in part removes some of the causes of irritation, by rendering the urine less stimulating to the bladder, when the irritation is there, and to the urethra in its passage through it. Diluting drinks may possibly lessen the susceptibility of irritation. The vegetable mucilages of certain seeds and plants, and the emollient gums are recommended. Mr. Hunter does not entertain much opinion of their efficacy, though some of his patients told him they experienced less uneasiness in making water, when their drink was impregnated with mucilaginous substances.

Emollient injections are the most proper, when the inflammation is very great; and they probably act by first simply washing away the matter, and then leaving a soft application to the part, so as to be singularly servicable, by lessening the irritating effects of the urine. Indeed, practice proves this; for a solution of gum-arabic, milk and water, or sweet oil, will often lessen the pain, and other symptoms, when the more active injections have done nothing, or seemed to do harm.

The irritation at the orifice of the urethra, is frequently so great, that the point of the syringe cannot be suffered to enter. In this case, no injection should be used till the inflammation has abated; but, in the mean while, fomentations may be employed.

Astringent injections act by lessening the discharge. They should only be used towards the latter end of the disease, when it has become mild. But, if the disease should begin mildly, they may be used at the very beginning; for, by gradually lessening the discharge, without increasing the inflammation, we complete the cure, and prevent a continuance of the discharge called *gleet*. They will have an irritating quality, if used strong, and hence increase the discharge, instead of lessening it. Mr. Hunter's experience did not teach him, that one astringent was much better than another. The astringent gums, as dragon's blood, the balsams, and the turpentines, dissolved in water; the juices of many vegetables, as oak, bark, Peruvian bark, tormentil root, and, perhaps, all the metallic salts, as green, blue, and white vitriols; the salts of mercury, and also alum; probably all act much in the same way; though the mere changing of an injection is often efficacious. The external applications are poultices, and fomentations, which can only be useful when the prepuce, glans, and orifice of the urethra are inflamed.

Since Mr. Hunter's time, many surgeons have been in the habit of keeping the penis, in the incipient inflammatory stage of gonorrhœa, covered with linen, kept continually wet with the saturnine lotion; a practice which is certainly both rational and beneficial. Mr. Abernethy, in his Lectures on Surgery, speaks in favour of this method.

When the glands of the urethra are enlarged, mercurial ointment may be rubbed on the part; but this will probably be of most service after the inflammation has subsided.

### TREATMENT OF GONORRHŒA IN WOMEN.

This is nearly the same as that of the disease in men, but is more simple. When the disorder is in the vagina, injections are best; and after them, the parts may be smeared with mercurial ointment, and the external parts washed with the injection. It is almost impossible for the patient to throw an injection into the urethra, when it is affected. The same injections are proper as for men; but they may be made doubly strong. When the glands of the vagina are enlarged, mercurial ointment should be freely applied; and when they form abscesses, these should be opened, and dressed.

### CONSTITUTIONAL TREATMENT OF GONORRHŒA.

In many strong plethoric constitutions, the symptoms are violent, and there is a great tendency to inflammatory fever. In such instances, opiate clysters, though at first productive of relief, sometimes occasion in the end fever, and consequently aggravate all the symptoms. The balsam capivi, sometimes, in such cases, increases the inflammatory symptoms. The treatment of this kind of constitution, consists chiefly in evacuations, the best of which are bleeding and gentle purging. The patient must sparingly, and, above all, use little exercise.

In the weak and irritable constitution, the symptoms are frequently very violent, the inflammation extending beyond the specific distance, running along the urethra, and even affecting the bladder. The indication, in this instance, is to strengthen; and bark alone has been known to effect a cure. All evacuations are hurtful.

The fever has been known to stop the discharge, relieve the pain in making water, and finally cure the disease. On other occasions, Mr. Hunter has seen all the symptoms of gonorrhœa cease on the accession of a fever, and return when the fever was subdued. In other examples, a gonorrhœa, mild at first, has been rendered severe by the coming on of a fever, and, on this ceasing, the gonorrhœa has ceased. Although a fever does not always cure a gonorrhœa, yet, as it may do so, nothing should be done while it lasts. If the local complaint should continue after the fever is gone, it is to be treated according to symptoms.

A gonorrhœa may be considerably affected by the patient's manner of living, and by other diseases attacking the constitution. Most things which hurry or increase the circulation, aggravate the symptoms; such as violent exercise, drinking strong liquors, eating strong indigestible food, some kinds of which act specifically on these parts, so as to increase the symptoms more than simply heating the body would do; such as peppers, spices, and spirits.

In cases which have begun mildly, in which the inflammation is only slight, or in others, in which the violent symptoms have subsided, such medicines as have a tendency to lessen the discharge, may be given, together with the local remedies before mentioned. Turpentines are the most efficacious. Cantharides, the salts of lead and copper, and alum, have also been recommended.

Mr. Hunter advises small doses of mercury, in consequence of the possibility of absorption, and with a view of preventing lues venerea.

### TREATMENT OF OCCASIONAL SYMPTOMS OF GONORRHŒA.

*Bleeding from the Urethra* is sometimes relieved by the balsam capivi. Mr. Hunter did not find astringent injections of use.

*Painful erections* are greatly prevented by taking twenty drops of tinctura opii at bed-time. Cicuta has also some power in this way.

*Chordee.* See this word.

*Bladder affected.* Opiate clysters, the warm bath, and bleeding, if the patient is of full habit, are proper. Leeches may be applied to the perinæum. When this affection lasts a considerable time, and is not mitigated by common methods, Mr. Hunter advises trying an opiate plaster on the pubes, or the loins, where the nerves of the bladder originate; or a small blister on the perinæum. In another place, he mentions bark, cicuta, sea air, and sea bathing, among the proper means.

*Swelled Testicles.* See *Hernia Humoralis.*

For a more full account of Gonorrhœa, according to the above doctrines, see a *Treatise on the Venereal Disease, by John Hunter*, from page 29 to 90.

### ON THE QUESTION, WHETHER GONORRHŒA IS REALLY A FORM OF THE VENEREAL DISEASE?

The foregoing remarks, and others in Mr. Hunter's work, would lead one to believe, that the poison of gonorrhœa and the venereal virus are the same. Here it is our duty impartially to state the arguments, which have been urged for, and against, this important doctrine.

Mr. Hunter assures us, that he has seen all the symptoms of lues venerea originating from gonorrhœa only; that he had even produced venereal chancres by inoculating with the matter of gonorrhœa; and that he afterwards repeated these experiments in a manner in which he could not be deceived. P. 293, & *seq.*

Mr. Hunter's experiments, it is true, have been repeated with a different result; but, as an eminent modern writer remarks, can we wonder at this, when we consider from how many causes gonorrhœa may arise, and how impossible it is to distinguish the venereal from any other? (*Observations on Morbid Poisons, by J. Adams, M.D. p.* 91. *edit.* 2.)

Another argument adduced by Hunter, in favour of the poisons of gonorrhœa and chancre being the same, is the probability, that the Otaheitans had the venereal disease propagated to them by European sailors, who were affected with gonorrhœa; for these can hardly be supposed to have had a chancre, during a voyage of five months, without the penis being destroyed.

It is impossible, however, to say what time may elapse, between the application of venereal poison to the penis, and the commencement of ulceration. Therefore, Bougainville's sailors, alluded to by Mr. Hunter, might have contracted the infection at Rio-de-la-Plata; but actual ulcers on the penis might not have formed till about five months afterwards, when the ship arrived at Otaheite.

In attempting to explain why a gonorrhœa and a chancre do not equally produce lues venerea, and why the medicine which almost universally cures chancre, has less effect on gonorrhœa, a modern advocate for Mr. Hunter's doctrine says, that we must take into consideration, that the seat of the two diseases is different; that the same cause may produce different effects upon different parts; that the same poison, when mixed with different fluids, may be more or less violent in its operation; and that there may be greater or less attraction of certain fluids to a part, according to its nature and composition. (*Inquiry into some Effects of the Venereal Poison by S. Sawrey,* 1802. p. 4.)

Mr. Sawrey very truly remarks, p. 6, that if gonorrhœal matter has clearly and decidedly produced chancre, or contaminated the system *in any one instance*, the question is determined. It could in no instance produce these effects, unless it had the power of doing so. This writer brings forward some cases to shew, that the poison of gonorrhœa may produce gonorrhœa, or chancre; but, the limits of this work only afford room to observe, that these instances are by no means decisive of the point, because some objections may be urged against them, as indeed, Mr. Sawrey himself allows. That Mr. Hunter's cases are inconclusive, I have endeavoured to explain in the *First Lines of the Practice of Surgery*, to which I must refer my readers.

Why does not gonorrhœa commonly produce ulceration in the urethra? Mr. Sawrey tries to solve this question, by saying, that the product of the venereal inflammation, the diseased contents of the small arteries of the urethra, are thrown out of these open-mouthed vessels into this canal, without any breach of their texture, which otherwise would be a necessary consequence.

Why does not gonorrhœa equally contaminate the system as chancre? In gonorrhœa, says Mr. Sawrey, the discharge is very plentiful; it is not, in general, attended with ulceration; the poison is much more diluted, and mixed with a mucous and puriform fluid. It is deposited in the urethra, and its lacunæ, where little or no pressure is applied, and it finds easy egress out of the canal. In chancre there is breach of substance, the poison is not much diluted, &c.

Why does not chancre generally, in the same person, produce gonorrhœa, and gonorrhœa chancre? Mr. Sawrey, in answer, expresses his belief, that these incidents are not very unfrequent. He says, he has known persons having a chancre, which continued for months, become affected, after that time, with a clap, without any further exposure. His opinion is, that the matter of the chancre had insinuated itself into the urethra, and produced the disease; though, he confesses, many would explain the circumstance, by supposing that the chancre and gonorrhœa were both communicated at the same time by two different poisons.

Mr. Hunter remarks, that the presence of one disease renders the adjacent parts less susceptible of its influence.

Mr. Sawrey concludes his second chap. with inclining to the idea, that the matter of gonorrhœa is not strictly pus, but of a more mucous nature than that of a chancre. However, when he mentions chemical attractions, as drawing the poison from mucus to the urethra, and from pus to the dry parts, in order to explain the last of the above questions, every sober reader must feel sorry, that a work, which contains some really sensible observations, should comprehend this most unfortunate one.

Mr. Whately has also written, in support of the opinion, that the matter of gonorrhœa and that of chancre, are the same. (See *Whately on Gonorrhœa Virulenta.*)

Another defender of this side of the question is Dr. Swediaur, who endeavours to prove the fallacy of the following positions: 1. *That the poison which produces the clap, does never, like that of chancres, produce any venereal symptoms in the mass or lues itself.* 2. *That the poison of the clap never produces chancres, and that the poison of chancres never produces a clap.* 3. *That mercury never contributes to, nor accelerates the cure of a clap; but that, on the contrary, every blennorrhagia may be certainly cured without mercury, and without any danger of leaving a lues behind.*

His arguments run thus:—the reason why claps do not, like chancres, constantly produce the lues, is, that most of them excite only a superficial inflammation in the membrane of the urethra, without any ulceration. Hence absorption cannot easily take place, the poison being out of the course of the circulation. But he has seen claps, with an ulcer in the urethra, followed by the most unequivocal symptoms of lues itself. He mentions the urethra being defended with a large quantity of mucus, as the thing impeding the common formation of ulcers, which do occasionally occur when the mucus is not secreted as usual, or is washed away. He asserts, that in many cases, where he had occasion to examine both parties, he was convinced that chancres were communicated by a person affected with a simple gonorrhœa; and, *vice versa*, that a virulent clap had been the consequence of an infection from a person having merely chancres. He says, that if a patient, with a venereal running, does not take care to keep the prepuce and glans perfectly clean, chancres will very often be produced. He owns a great many claps are cured without mercury: yet, repeated experience has shewn him, a cure cannot always be thus accomplished.—Mild cases, without ulcer or excoriation in the urethra, may certainly be radically cured without a grain of mercury; and though mercury should be given, it would not have the least effect: not because the disease does not proceed from a venereal poison, but because out of the course of the circulation. He contends, that the topical use of mercury in injections, acts usefully even in these cases. But, when a clap is joined with ulceration in the urethra, it is always cured more safely and expeditiously with mercury, and is frequently incurable without it. A lues also follows cases attended with ulcers in the urethra. He allows that all claps are not venereal. (See *Practical Observations on Venereal Complaints, by J. Swediaur.*)

One argument urged against the identity of gonorrhœal and chancrous virus, is, that gonorrhœa was not described as a symptom, till nearly half a century after the other symptoms of the venereal disease were known. Fallopius is among the first who observed gonorrhœa, as a symptom of the venereal disease. "If, however," says Dr. Adams, "venereal gonorrhœa was unnoticed till about fifty years after the other forms of the disease were described, what does this prove, but that contagious gonorrhœa was so common, as to be disregarded as a symptom of the new complaint? Can there be a doubt, from the caution given by Moses, that gonorrhœa was considered as contagious in his days? During the classical age, we find inconveniences of the urinary passages, were imputed to incontinence; and the police of several states, before the siege of Naples, made laws for preserving the health of such as would content themselves with public stews, instead of disturbing the peace of families. This is enough to lessen our surprise, that gonorrhœa should be unnoticed for some time after the appearance of the venereal disease. But, so far is it from proving the two contagions are different, that the fairest inference we can draw is in favour of their identity. For, if by this time the venereal disease began to be so far understood, that secondary symptoms were found the consequence of primary ones in the genitals, it is most probable that the first suspicion of venereal gonorrhœa arose from the occurrence of such secondary appearances, where no other primary symptoms could be traced. (*Adams on Morbid Poisons, p. 95, Edit. 2.*)

In relating the arguments maintained by the best modern writers, to repel the attacks made on the doctrine, that gonorrhœa and chancre arise from the same poison, we have been compelled to disclose the chief grounds, on which the assailants venture to entertain a contrary theory.

Mr. B. Bell is the principal author who has written against the opinions maintained by Hunter, Sawrey, Swediaur, Adams, &c. Our limits will only allow us just to enumerate a few of his leading arguments.

If the matter of gonorrhœa, and that of chancre, were of the same nature, we must admit that a person with a chancre only, can communicate to another, not only every symptom of pox, but of gonorrhœa; and that another, with gonorrhœa only, can give to all, with whom he may have connexion, chancres, with their various consequences. This ought, indeed, to be a very frequent occurrence; whereas, all allow that it is even in appearance very rare.

On the supposition of the matter of gonorrhœa and lues venerea being the same, the latter ought to be a much more frequent occurrence than the former, from the greater ease with which the matter of infection must, in every instance, be applied to those parts on which it can produce chancres, than to the urethra, where, instead of chancre or ulceration, it almost always excites gonorrhœa. It is difficult to conceive how the matter, by which the disease is communicated, should find access into the urethra; while all the external parts of the penis, particularly the glans, must be easily and universally exposed to it; and yet gonorrhœa is a much more frequent disease than pox. Cases of gonorrhœa are in proportion to those of chancre, according to Mr. B. Bell's experience, as three to one. It is obvious that the very reverse should happen, if the two diseases were produced by the same kind of matter.

I need not adduce other arguments, as the reader must be already acquainted with any worth knowing, from what is said in the previous part of the present article.

The grand practical consideration, depending on the possibility of the venereal disease arising from gonorrhœa, is, whether mercurials should not be exhibited, in all cases, with a view of preventing such a consequence.

Waving, on my own part, all attempts to decide the point, whether the matter of a chancre, and that of gonorrhœa, are of the same nature, I shall merely content myself with stating, that, as far as my observation and enquiries extend, the majority of the best practitioners of the present day consider the exhibition of mercury unnecessary, and, consequently, improper in cases of gonorrhœa. This fact almost amounts to a proof, that if venereal symptoms do ever follow a clap, they are so excessively rare, and, I may add, always so imputable to other causes, that the employment of mercury, as a prevention, would, upon the whole, do more injury than benefit to mankind; and this even admitting (what, in my mind, has never been unequivocally proved) that the matter of gonorrhœa is really capable, in a very few instances, of giving rise to the venereal disease.

The reader must weigh the different arguments himself. Some of Mr. B. Bell's reasoning is certainly untenable, as Sawrey has clearly shewn; but the latter, also, is not invulnerable in many points, which he strives to defend.

The reader is referred, for further information, to *A Treatise on the Venereal Disease, by John Hunter;* 1788. *Whately on the Gonorrhœa Virulenta;* 1801. *Practical Observations on Venereal Complaints, by F. Swediaur, M.D. edit.* 3. *An Enquiry into some of the Effects of the Venereal Poison, by S. Sawrey;* 1802. *Observations on Morbid Poisons, by J. Adams, M.D. edit.* 2. 1807.

**GORGET.** An instrument used in the operation of lithotomy, for the purpose of cutting the prostate gland and neck of the bladder, so as to enable the operator to introduce the forceps and extract the stone. It is, in fact, a sort of knife, at the end of which is a beak, that fits the groove of the staff, and admits of being pushed along it into the bladder.

Besides cutting gorgets, constructed for the preceding design, there are also blunt ones, intended to be introduced into the wound, when their concavity serves as a guide for the forceps into the bladder.

**GRANULATIONS,** (from *granum*, a grain.) The little grain-like, fleshy bodies, which form on the surfaces of ulcers, and suppurating wounds, and serve both for filling up the cavities, and bringing nearer together and uniting their sides.

We must here consider the operations of nature, in bringing parts as nearly as possible to their original state, whose disposition, action, and structure have been altered by accident, or disease. Having formed pus, she immediately sets about forming new matter, upon surfaces in which there has been a breach of continuity. This process is called *granulating*, or *incarnation;* and the substance formed is called *granulations*.

Granulations are an accretion of animal matter upon the wounded, or exposed surface; they are formed by an exudation of the coagulating lymph from the vessels; into which new substance, both the old vessels very probably extend, and in which new ones are formed. Hence, granulations are extremely vascular; indeed, more so than almost any other animal substance. "That this is the case (says Mr. Hunter) is seen in sores every day. I have often been able to trace the growth and vascularity of this new substance. I have seen upon a sore a white substance exactly similar, in every visible respect, to coagulating lymph. I have not attempted to wipe it off, and the next day of dressing I have found this very substance vascular; for, by wiping, or touching it with a probe, it has bled freely. I have observed the same appearance on the surface of a bone, that has been laid bare. I once scraped off some of the external surface of a bone of the foot to see if the surface would granulate. I remarked the following day, that the surface of the bone was covered with a whitish substance, having a tinge of blue. When I passed my probe into it, I did not feel the bone bare, but only its resistance. I conceived this substance to be coagulable lymph thrown out from inflammation, and that it would be forced off when suppuration came on; but, on the succeeding day, I found it vascular, and appearing like healthy granulations." The vessels in granulations pass from the original parts to their basis, and thence towards their external surface, in tolerably regular parallel lines. The surface of this new substance has the same disposition to secrete pus, as the parts which produced it. The surfaces of granulations are very convex, the reverse of ulceration, having a great many small points, or eminences, so as to appear rough. The smaller such points are, the more healthy are the granulations. The colour of healthy granulations is a deep florid red. When livid, they are unhealthy, and have only a languid circulation. Healthy granulations, on an exposed or flat surface, rise nearly even with the surface of the surrounding skin, and often a little higher; but, when they exceed this, and take on a growing disposition, they are unhealthy, become soft, spongy, and without any disposition to form skin. Healthy granulations are always prone to unite to each other, so as to be the means of uniting parts.

Granulations are not easily formed on the side of an abscess, nearest the surface of the body.

They are not endowed with the same powers as parts originally formed. Hence, they more readily ulcerate, and mortify. The curious mode in which granulations contract, when sores are healing, and even for some time after they are healed, we have explained in the article *Cicatrization.* (See *A Treatise on the Blood, Inflammation, &c. by John Hunter, p.* 473, *et seq.* 1794.)

It is a question whether granulations can ever be formed without suppuration? Mr. Hunter seems inclined to think, that they may occasionally be produced without it, and he supports his opinion by the relation of the dissection of a fractured limb, in which he observed a substance resembling granulations. Dr. John Thomson, on the other hand, declares, that he has never seen any thing, which he could regard as an example of a granulation, and still less of a granulating surface, where pus was not formed. (See *Lectures on Inflammation, p.* 408.)

The exact process, by which the blood vessels, nerves, and absorbents of granulations are formed, is still amongst the secrets of nature. The observations of Mr. Hunter on the subject amount only to conjecture. "The growth of nerves, and their developement in new formed flesh, or granulations (says Dr. J. Thomson), is a subject of equal curiosity with the growth of blood-vessels in the same structure. Their existence in granulations is proved by the pain, which is felt on our pinching, rubbing, or wiping, the surface of a sore. Even the granulations, which arise from the surface of bone, are sensible, though we are not very well able to prove the sensibility of the larger branches of nerves, from which the newly formed, and sensible nerves and filaments in the granulation, are immediately derived. All the difficulties, which I formerly mentioned to you, as occurring in the explanation of the manner in which coagulable lymph, or granulations, are penetrated with blood-vessels, present themselves the moment we begin to reflect on the manner, in which the same granulations are provided with nerves, and these difficulties are still increased, when we reflect, that the same granulations are in the course of a few hours provided, not only with blood-vessels and nerves, but also with a system of absorbents. The existence of absorbents in granulations is proved, not only by the changes of bulk, which we see them daily undergo, becoming gradually, in the healthy state, smaller, firmer, and more compact, but, also, by the frequent disappearance, in whole, or in part, of a granulating surface by the process of ulcerative absorption." (See *Thomson's Lectures on Inflammation, p.* 419.) Every young dresser of sores at an hospital, who has been too lavish of the red precipitate ointment, must have learned from experience, that the mercury may be absorbed from the surface of the ulcers, and bring on an unwished-for salivation of the patients.

**GUAIACUM.** (from an Indian word.) Many writers of the sixteenth century, contended that guaiacum was a true specific for the venereal disease; and the celebrated Boerhaave, in the eighteenth, maintained the same opinion. Mr. Pearson mentions, that when he was first entrusted with the care of the Lock Hospital, in 1781, Mr. Bromfield and Mr. Williams were in the habit of reposing great confidence in the efficacy of a decoction of guaiacum wood. This was administered to such patients as had already employed the usual quantity of mercury; but who complained of nocturnal pains, or had gummata, nodes, ozæna, and such other effects of the venereal virus, connected with secondary symptoms, as did not yield to a course of mercurial frictions. The diet consisted of raisins, and hard biscuit; from two to four pints of the decoction were taken every day; the hot bath was used twice a week; and a dose of antimonial wine and laudanum or Dover's powder, was commonly taken every evening. Constant confinement to bed was not deemed necessary; neither was exposure to the vapor of burning spirit, with a view of exciting perspiration, often practised; as only a moist state of the skin was desired. This treatment was, sometimes, of singular advantage to those whose health had sustained injury from the disease, long confinement, and mercury. The strength increased; bad ulcers healed; exfoliations were completed; and these anomalous symptoms, which would have been exasperated by mercury, soon yielded to guaiacum.

Besides such cases, in which the good effects of guaiacum caused it to be erroneously regarded, as a specific for the lues venerea, the medicine was also formerly given, by some, on the first attack of the venereal disease. The disorder being thus benefited, a radical cure was considered to be accomplished; and, though frequent relapses followed, yet, as these partly yielded to the same remedy, its reputation was still kept up. Many diseases, also, which got well, were probably not really venereal cases. Mr. Pearson seems to allow, that, in syphilitic affections, it may, indeed, operate like a true antidote, suspending, for a time, the progress of certain venereal symptoms, and removing other appearances altogether; but, he observes, that experience has evinced, that the unsubdued virus yet remains active in the constitution.

Mr. Pearson has found guaiacum of little use in pains of the bones, except when it proved sudorific; but, that it was then inferior to antimony, or volatile alkali. When the constitution has been impaired by mercury, and long confinement, a thickened state of the ligaments, or periosteum, or foul ulcers, still remaining, Mr. Pearson says, these effects will often subside, during the exhibition of the decoction. He says, it will often suspend, for a short time, the progress of certain secondary symptoms of the lues venerea; for instance, ulcers of the tonsils, venereal eruptions, and even nodes. Mr. Pearson, however, never knew one instance in which guaiacum eradicated the virus; and he contends, that, its being conjoined with mercury, neither increases the virtue of this mineral, lessens its bad effects, nor diminishes the necessity of giving a certain quantity of it. Mr. Pearson remarks, that he has seen guaiacum produce good effects in many patients having cutaneous diseases, the ozæna, and scrofulous affections of the membranes and ligaments. (See *Pearson on the Effects of Various Articles in the Cure of Lues Venerea, edit.* 2. 1807.)

**GUMMA**, a soft tumour, so named from the resemblance of its contents to gums.

**GUN-SHOT WOUNDS** receive their name from the manner, in which they are produced, being generally caused by hard, obtuse, metallic bodies, projected from cannons, muskets, or some other species of firearm. With such injuries, it is also usual to comprehend a variety of dreadful accidents arising from the explosion of shells, or the violence, with which pieces of stones from ramparts, or splinters of wood on board of ship, are driven about. Gunshot wounds are the most considerable of the contused kind; and what is to be said of them, will apply, more or less, to all contused wounds, according to the degree of contusion. They are particularly characterized by, what the French surgeons are fond of calling, a *disorganization* of their surface. The excessive contusion, or rather comminution, observable in gunshot wounds, depends upon the rapidity, with which the bodies occasioning them, are propelled. The parts, touched by the ball, are converted into a blackish slough, the colour of which made our ancestors suppose, that bodies, projected by gunpowder, became heated, and actually burnt the flesh, with which they came into contact. But reason and experience have now proved, that whatever may be the rapidity of a projectile, it never acquires in its passage any perceptible heat. Indeed, a modern writer asserts, that such a degree of heat as would be requisite to make a ball burn parts in its passage, would really melt it. (*Richerand, Nosographie Chirurgicale, Tom.* 1, *p.* 217, *edit.* 2.) In general, gunshot wounds do not bleed, unless very large blood-vessels are injured; their circumference is often livid; and the shock, that attends their infliction, is particularly apt to occasion in the limb, or part, a kind of torpor, which, in many instances, extends itself to the whole system.

Until Ambroise Paré introduced more correct theories upon the subject, ideas, the most false, and errors, highly prejudicial, prevailed both in the history and treatment of gunshot wounds. Cannon-balls and bullets sometimes produce most dreadful injury, without occasioning any breach of continuity in the integuments. This observation is so strictly true, that the muscles and bones may actually be crushed and broken to atoms, without the skin being at all wounded. Such cases were for a long while imputed to the violent motion, supposed to be communicated to the air by the ball itself. It was imagined, that this elastic fluid, being rapidly displaced by the shock of the projectile, was capable of making such pressure on surrounding bodies, as to destroy their texture. But how could this violent pressure originate in the midst of the open and unbounded air? If this theory were true, the effect in question would constantly happen, whenever a ball passes near any part of the body. The contrary, however, is so much the case, that pieces of soldiers and seamens hats, of their feathers, clothes, and even hair, are shot away in every battle, without any other mischief being done.

In consequence of the manner, in which such injuries of the soft parts and even of the bones, unattended with any breach in the skin, have been supposed to be produced, they have been erroneously termed *wind-contusions*. In fact, these cases are now universally acknowledged by all the most accurate observers never to proceed from the cause, to which formerly they were always ascribed.

The air does not move with the same rapidity as the ball; but its motion is less in proportion as it is a more subtile matter, and must be too feeble to account for such a violent degree of injury. The air, to which the ball must really communicate the greatest motion, is what is directly before it; and this never bruises the part untouched by the ball itself. It is only the air situated laterally to the shot, that is imagined to do injury, and it cannot be greatly agitated. The violent consequences of sudden explosions, and the effects produced on the organs of hearing, by strong commotions of the air, prove nothing relative to the point in question. Lastly, experience does not confirm the reality of such wind-contusions; for, cannon-balls often tear off whole members, without the adjacent parts being in the least injured. (See *Le Vacher, in Memoires de l'Academie de Chirurgie, tom.* 4. *p.* 22.)

An eminent professor, who visited the continent for the purpose of seeing the wounded after the battle of Waterloo, fully coincides with M. le Vacher and all the moderns upon this subject. "We saw, and were informed of, many instances, in which cannon-balls had passed quite close to all the parts of the body, and had removed portions of the clothes and accoutrements, without producing the slightest injury of any kind. In other instances, portions of the body itself were removed by cannon-balls, without the contiguous parts having been much injured. In one case, the point of the nose was carried off by a cannon-ball, without respiration being at all affected; and in another very remarkable case, the external part of the ear was shot away, without even the power of hearing being sensibly impaired." (See *Report of Observations made in the British Military Hospitals in Belgium, &c. by John Thomson, p.* 33, *Edinb.* 1816.)

I could cite many cases, which I have seen myself, in proof of the truth of Le Vacher's opinions; but, the point is now so universally admitted that I shall merely add one observation that occurred to the notice of many as well as myself. At the bombardment of the French fleet in the basin of Antwerp early in 1814, a cannon-shot shattered the legs of two officers so badly, that the limbs were amputated. These gentlemen were walking at the moment of the accident in the village of Merksam, taking hold of the arm of my friend Assistant surgeon Stobo, of the 37th regiment, who was in the middle. Now the ball, which produced the injury, did not the slightest harm to the latter gentleman, although it must have passed as close as possible to his lower extremities, and most probably between them.

Neither can what have been improperly called, *wind contusions,* be attributed to an electrical shock on the parts, in consequence of the ball being rendered electrical by friction in the calibre of the gun, and giving off the electricity as it passes by. (Vide *Plenk's Sammlungen,* 1 *Theil. p.* 99.) Metals never acquire this property from friction.

The mischief, imputed to the air, is occasioned by the ball itself. Its producing a violent contusion, without tearing the skin, and entering the limb, is to be ascribed to the oblique direction in which it strikes the part, or, in other instances, to the feebleness, with which the ball strikes the surface of the body, in consequence of its having lost the greater part of its momentum, and acting principally by its weight, being, in short, what is called a spent ball. Daily observation evinces, that balls, which obliquely strike a surface, do not penetrate, but are reflected; though they may be impelled with the greatest force, and the body struck may be as soft and yielding as water. This alteration in the course of the ball, not only happens on the surface of the human body, but also in the substance of a limb which it has entered. A bone, a tendon, &c. may change the direction of a ball which touches them at all obliquely. Hence, it is manifest, how it happens, that the track of a gun-shot wound is not always straight, and how balls sometimes run under the integuments nearly all round the body, or limb.

The causes of several of the peculiarities, attending gun-shot wounds, are to be sought among the laws, by which moving bodies are governed, and by which, the mechanical effect of a ball, propelled against any part of the body, must therefore be determined. The form, the momentum, and the direction of the shot, that is received; the position, and the variety of structure, or, in other words, the variety of density and powers of resistance, in the part receiving it; must always be considered, in order to account satisfactorily for the effects, which it produces.

A body in motion, striking against any substance, will communicate a part of its momentum to the substance, against which it strikes; and this communication will be in a direct ratio to the powers of resistance, which that substance possesses at the time; whether such power of resistance be derived from its own density, or bulk, or force of cohesion, or momentum acting in a different direction. Hence, if the resistance be equal, or superior to the momentum, the motion will be stopped; the momentum, in this case, being equally divided between the body impelled and the body resisting. If the resistance be inferior, the motion will only be lessened; and if, besides being inferior, and therefore incapable of stopping the moving body, it also operates in a different direction, the future line of motion will likewise be changed, and fly off from the point, at which it meets with resistance, in a line, which will form an angle with that of the original direction, in which it moved.

The resistance, made by any substance to the motion of another, will be greater, or less, *cæteris paribus,* as the angle of incidence approaches to, or recedes from a right angle; and, if it be reflected, and the motion be continued in the same medium, the angle of reflection will always be equal to the angle of incidence.

The resistance, made to a moving body, by the density of any medium, in which it moves, will be, *cæteris paribus,* as the surface of the moving body presented to that medium.

A dense medium forms a continued resistance to a body propelled with any given velocity; and, therefore, the more dense the medium, the greater the resistance, and the sooner the original momentum will be overcome by it.

A shot, moving through any medium of uniform density, will also be acted on by the attraction of gravitation, so as to be continually changing the direction in which it moves; and, if it move in vacuo, or in air, it will describe the curve called a parabola. The commencement of this curve does not take place at the point, at which the gunpowder explodes; for, within the barrel, and to some distance beyond it, the shot moves forward in a right line, called the *line of the impulse of fire,* (*Helsham's Lect.* 2, *p.* 187;) which line will extend farthest horizontally, the less the angle of elevation of the piece recedes from an horizontal line.

The less of the original impulse is left in a shot still moving, the more liable will it be to be stopped, or turned out of its course by any given resistance.

Every new resistance, which a shot in motion meets with, as Mr. Chevalier has remarked, will operate so as to produce not only a diminution of its momentum, but, also, a change in its direction; every fresh resistance being in fact equivalent to a fresh power, acting in a different line from that, in which the shot was previously moving.

As a body, acted on at once by two powers, will not move in the direction of either, but, in the diagonal of a parallelogram, of which two sides are formed by the direction and momentum, given by each of those powers respectively, so every change of impulse, or resistance, will cause the body to move in so many changes of direction, till at length its momentum is overcome, and it becomes quiescent.

A continued resistance from a dense medium will be a continued application of a power, the uniform and equable operation of which will cause the motion to be curvilinear, the reason of which is sufficiently explained by writers on projectiles.

Mr. Chevalier afterwards explains, that a shot, or other hard body, falling upon a soft one, as for example, an adipose membrane, or muscle, and stopping there, or lodging in it, still acts in conformity to the same general laws, and stops only from the resistance it meets with. If this resistance is made only by the force of cohesion in the adipose membrane, or muscle, so much of that cohesion is overcome, as was equal to the momentum of the shot, when it impinged against it; and, therefore, so far, and only so far, is its substance broken through or destroyed.

It is only on such principles, that we can explain the intricate and varied course and effect of balls in parts of diversified structure, consisting of substances differing in density and powers of resistance. And, though, says Mr. Chevalier, in many cases, a mathematical explication of the course of a ball cannot be given; this arises entirely from the want of data, the laws of matter being fixed and immutable. But, when the data are known, as, for instance, the velocity and direction of the shot, the position of the patient, or of the wounded part at the time of the accident, and the structure of the parts penetrated, a much more probable conjecture of the course of the ball may generally be formed, than if these circumstances had not been regarded.

From the foregoing account, we may see the reason of the concussion, or shock, which is given, in many instances, to the whole system by gun-shot wounds, and which is represented by the best writers on this subject, to be often attended with grave and even alarming effects, extending not only over the injured part, but affecting the system at large. A shot, striking against a tendon, or a bone, in one of the extremities, will produce a greater concussion, than if it struck only against softer parts.

A shot, striking against a muscle in action, will produce more concussion, than if it struck against the same part of the same muscle at rest. And a shot, striking the head, or wounding the liver, lungs, or intestinal canal, will generally bring on instantaneous derangement of the whole system, with which the functions of these parts are so closely connected. To all this must be added an alarm, which takes sudden possession of the mind, and is increased by the uncertainty of the patient about his real state. Such apprehension, the most determined courage is not always able to withstand. (See *a Treatise on Gun-shot Wounds, by Thomas Chevalier, Part* 1 *sect.* 7.)

A ball, when it strikes a part of the body, may cause four kinds of injury. 1. It may only occasion a contusion, without penetrating the part, on account of its being too much spent, or of the oblique way in which it strikes the surface of the body. 2. It may enter and lodge in the substance of a part; in which case, the track of the wound has only one aperture. 3. It may pierce through and through; and then there are two openings, one at the entrance, the other at the exit of the ball. The circumference of the aperture, where the shot entered, is usually depressed: that of the opening, from which it came out, elevated. At the entrance, there is commonly more contusion than at the exit of the ball. The former is generally narrower; the latter wider, and more irregular, especially when the round smooth figure of the ball has been changed by its having struck a bone. 4. A cannon-ball may tear off a whole limb. (*Richter's Anfangsgrunde der Wundarzneykunst, Band* 1.)

Gun-shot wounds differ very much, according to the kind of body projected, its velocity, and the nature and peculiarities of the parts injured. The projected bodies are mostly bullets, sometimes cannon-balls, sometimes pieces of broken shells, and very often, on board of ship, splinters of wood. On account of the contusion, which the parts suffer, *from* the violent passage of the ball through them, there is most commonly a part of the solids surrounding the wound deadened, which is afterwards thrown off in the form of a slough, and which prevents such wounds from healing by the first intention, and makes most of them necessarily suppurate. This does not take place equally in every gun-shot wound, nor in every part of the same wound; and the difference commonly arises from the variety in the velocity of the body projected; for, where the ball has passed with little velocity, which is sometimes the case at their entrance, but, still more frequent at the part last wounded, the injury may often be healed by the first intention. (*J. Hunter, p.* 523.)

Foreign bodies are more frequently met with in gun-shot wounds than any others, and are commonly of three kinds. 1. Pieces of clothing, or other things, which the ball forced before it into the limb. 2 The ball itself. 3. Loose splinters of bone. It is only when the ball strikes a naked part, touches no bone, and goes through and through, that the wound can be free from extraneous matter. Foreign bodies are the cause of numerous unfavourable symptoms, by irritating sensible parts, and exciting pain, inflammation, convulsions, hemorrhage, long suppurations, &c. They are constantly more productive of such evils, the more uneven, pointed, and hard they are. Hence spiculæ of bone are always the most to be dreaded. (*Richter.*)

The great obliquity and length of the fissures, produced in the cylindrical bones by musket balls, are such as are not remarked in any common cases of fracture. When I was with the army in Holland, in the year 1814, I had in my hospital at Oudenbosch several fatal compound fractures of the thigh, caused by gun-shot violence. The fissures in some of these examples were found to extend two-thirds of the length of the bone. This fact is noticed by Mr. Guthrie: "the fractures extend far above and below the immediate part struck by the ball, and as far as depends upon my information from the examination of limbs that were amputated, further downwards than upwards; so that from a fracture in the middle of the thigh, I have often seen fissures extend into the condyles, and cause ulceration of the cartilages of the knee joint," &c. (*On Gunshot Wounds, p.* 190.)

When a ball strikes a bone, the concussion produced is another occasion of bad symptoms, to be added to those already mentioned. When slight, its effects are confined to the injured limb. Sometimes they extend to the neighbouring joints, in which they produce inflammation and abscesses.

It is commonly stated, in surgical books, that, when a cannon-ball tears off a limb, it produces a most violent concussion of the whole body, and a general derangement of all its functions. This, however, is by no means always true. I saw some years ago, in London, a young sailor, whose arm was completely torn off at the shoulder, by a cannon-ball from one of the forts at Guadaloupe, in March 1808; he suffered no dreadful concussion of his body, nor were his senses at all impaired. This case was very remarkable, as the scapula was so shattered, that Mr. Cummings, of Antigua, was under the necessity of removing the whole of it. The patient recovered in two months. From the account I heard, I do not believe the axillary artery bled immediately after the accident. The young man was shewn to the gentlemen of St. Bartholomew's Hospital, quite well.

There is one curious effect, which occasionally follows gun-shot wounds; but, I do not pretend to understand the rationale of it: viz. inflammation and suppuration of some internal viscus, especially of the liver. Several such cases are related in the *Mem. de l'Acad. de Chirurgie*, and according to a late writer, many patients in the peninsula, who had undergone secondary amputations for gun-shot injuries, were destroyed by affections of their lungs, liver, &c. (See *Guthrie on Gun-shot Wounds of the Extremities, p.* 74, *et seq.*)

From the circumstance of the inner surface of gun-shot wounds being more or less deadened, they are late in inflaming. But, when a ball has fractured a bone, which fracture has occasioned great injury of the soft parts, independently of that caused immediately by the ball itself, the inflammation will come on as quickly, as in cases of compound fracture; because the deadened part bears no proportion to the laceration or wound in general. (*J. Hunter, p.* 524.)

From the same circumstance of a part being often deadened, gun-shot wounds frequently cannot be completely understood in the first instance, for, in many cases, it is at first impossible to know what parts are killed, whether bone, tendon, or soft part. Nor can this be ascertained till the slough separates, which often makes the wound much more complicated than was previously imagined. For, very often, some viscus, or a part of some viscus, or a part of some large artery, or even a bone, has been killed by the violence. If a piece of intestine has been killed, the contents of the bowel will begin to come through the wound when the slough separates. If a portion of a large blood-vessel be killed, a profuse, and even fatal hemorrhage may come on, when the slough is detached, although not a drop of blood may have been previously lost. (See *Hunter, p.* 525.) A soldier of the 2d battalion of the 44th regiment was shot in the ham at the assault of Bergen-op-zoom in 1814. There was no hemorrhage for ten days; but, at the end of this period, the popliteal artery gave way, and I was obliged to take up the femoral artery, by which means the bleeding was effectually stopped.

When the ball moves with little velocity, the mischief is generally less; the bones are not so likely to be fractured; the parts are less deadened, &c. However, when the velocity is just great enough to splinter a bone, which is touched, the splintering is generally more extensive, than if the impetus of the ball had been much greater, in which case, a piece is more likely to be taken out. When the ball moves slowly, it is more likely to be turned by any resistance it may encounter in its passage through parts, and hence the wound is more apt to take a winding course.

When a ball enters a part with great velocity, but is almost spent, when it comes out again, in consequence of the resistance it has met with, there may be a good deal of sloughing about the entrance, and little or none about the exit, owing to the different degrees of celerity with which the ball traversed the parts. (See *Hunter.*)

Gun-shot wounds may have either one, or two apertures, according as the ball has lodged, or passed quite through the part. In some cases, the openings are diametrically opposite each other; in others they are not so, the direction of the ball having been changed by the resistance, which it has met with from a bone, cartilage, tendon, &c. Thus a ball has been known to enter just on the inside of the ankle, and come out near the knee, to enter the fore-head and come out at the temple, &c. (*Richerand, Nosographie Chirurgicale, Tom.* 1, *p.* 219, *Edit.* 2.) The opening, where the ball enters, is always smaller than that from which it escapes, and its margin is forced inwards, while the circumference of the other aperture is quite prominent. The contusion and injury, which the parts suffer, are also greatest about the entrance of the ball, owing to the more considerable impetus, with which it moves. The yellowish livid hue, around gun-shot wounds, is a sort of ecchymosis, or extravasation of blood. The injured member is often benumbed and stupified, and, when mortification occurs, it spreads with extraordinary rapidity. When the whole constitution is thrown into this kind of torpor, the most fatal consequences are to be apprehended. "C'est dans cet état, (says Richerand) que mourut le chevauléger, dont parle Quesnay; l'état d'hébêtude était tel, que cet individu à qui l'on proposa l'amputation de la jambe, répondit que ce n'était pas son affaire." (*Nosographie Chirurg. Tom.* 1, *p.* 221, *Edit.* 2.) In cases of gun-shot wounds, sudden shiverings, syncope, and nervous symptoms are not unfrequent. Such occurrences, with other bad effects, made the ancients suspect, that something poisonous was carried into the wound; an opinion, which is now well known to be erroneous.

When there is only one opening, we may infer, that the wound contains a foreign body. When there are two apertures, the ball has escaped; but, pieces of the clothes, &c. may still be lodged in the part.

As a modern writer has accurately explained: "It is no uncommon thing for a ball, in striking against the sharp edge of a bone, to be split into two pieces, each of which takes a different direction. Sometimes, it happens, that one of the pieces remains in the place, which it struck, while the other continues its course through the body. Of a ball, split by the edge of the patella, I have known one half pass through at the moment of the injury, and the other remain in the joint for months, without its presence there being suspected. In the same manner, I have known a ball divided by striking against the spine of the scapula, and one portion of it pass directly through the chest, from the point of impulse, while the other moved along the integuments till it reached the elbow-joint. But, the most frequent examples of the division of bullets, which we had occasion to see, were those which were produced by balls striking against the spherical surface of the cranium. It sometimes happens, that one portion of the ball enters the cranium, while the other either remains without, or passes over its external surface. Not unfrequently, in injuries of the cranium, the balls are lodged between its two tables, in some instances much flattened, and altered in their shape, and, in other instances, without their form being changed." From these facts, it must be evident, that even when a gun-shot wound has two orifices, the surgeon cannot be certain, that the bullet has not been divided, and that no portion is lodged, unless the entire ball itself happen to be found. (See *Thomson's Reports of Obs. in Military Hospitals in Belgium, p.* 37, *&c.*)

As the ends of the torn vessels are contused and compressed, gun-shot wounds have little propensity to bleed much, and, unless very considerable vessels are lacerated, they do not bleed at all: sometimes not in this case. The greatest danger of bleeding is always when the dead parts are detached, eight or ten days after the injury. Thus, (as I have already mentioned) in one of my own patients, who had received a musket ball through the ham, the popliteal artery gave way about ten days after the injury, and compelled me to take up the femoral artery. The bleeding immediately ceased, and the man recovered.

It has long been known, that a limb may be torn, or shot off, even near to the trunk of the body, and hardly any hemorrhage arise. We had numerous proofs of this fact after the battle of Waterloo. I had under my care a man of the rifle brigade, whose arm was shattered to pieces as high as the shoulder, yet there was no hemorrhage. I amputated the thigh of a Dutch soldier, whose leg had been completely shot off by a cannon-ball; but there was no hemorrhage before the operation. At Merksam, in 1814, I saw a case, in which the greater part of the clavicle, scapula, and many adjacent parts had been carried away by a cannon-ball; and yet no bleeding of consequence occurred.

Sometimes after these violent injuries,

the large arteries do not bleed in amputation. "We saw a man (says Dr. Thomson) whose leg had been shot off by a cannon-ball; in amputating his limb above the knee, the arteries of the thigh were not perceived to bleed; nor did any of them afterwards require to be tied. A case, similar to this, also presented itself, in which the arm had been shot away close to the shoulder-joint."

Sometimes the contusion produced by a cannon-ball, or the passage of a bullet in the vicinity of a large artery, seems to cause a laceration of the inner coat of the vessel, and a subsequent obliteration of its cavity by the effusion of coagulable lymph. Facts, in proof of this statement, are recorded by Dr. Thomson. (See *Reports of Observ. in the Military Hospitals in Belgium, p.* 34—35.)

Angular uneven bodies, such as pieces of iron, cut lead, &c. occasion far more dangerous wounds, than round even bodies, like leaden bullets. Wounds occasioned by a small shot, are frequently more perilous, than others produced by larger balls: because their track is so narrow, that it cannot be traced, nor consequently the extraneous body itself extracted. Such a shot oftentimes injures a viscus, when there is not the smallest external symptom of the occurrence. Sometimes a great part of the danger, also, arises from the number of the shots which have entered.

In a subsequent section of this article, the valuable observations of M. Larrey, upon the question of amputation, in cases of gun-shot wounds, will be fully detailed.

### TREATMENT OF GUN-SHOT WOUNDS.

The first thing in the treatment of a gun-shot wound in one of the extremities, is to determine, whether it is most advisable to amputate the limb immediately, or to undertake the cure of the wound. When a bone, especially at a joint, is very much shattered; when the fleshy parts, particularly the great blood-vessels and nerves are lacerated; when the whole limb has suffered a violent concussion, and is cold and senseless; there is no hope of preserving it. In this case, it is the surgeon's duty to amputate at once, and not to delay till mortification commences. But, besides this violent degree of injury, in which the propriety of amputation is obvious, there are several lower degrees, in which it is often a difficult thing to decide whether amputation is necessary or not. Here the surgeon must look not only to the injury, but also to the patient's constitution, and even to external circumstances, such as the possibility or impossibility of procuring good accommodation, rest, attendance, and pure air. But it is impossible to determine the necessity of amputation by general rules. In every individual case, the surgeon must consider maturely the particular circumstances, before he ventures to decide. The grounds against the operation are; the pain which it causes at a period when the whole system is disordered by a terrible injury; the privation of a limb; and frequent examples, in which nature, aided by judicious surgery, repairs the most horrible wounds. The following are the reasons in favour of the operation. By it the patient gets rid of a dreadful contused wound, which threatens the greatest peril, and which is exchanged, as it were, for a simple incised one. The pain of amputation is not of more moment than the pain which the requisite incisions, and the extraction of foreign bodies, would cause in case the operation is abandoned. The wound of amputation is not so much to be apprehended, as experience shews, that incisions, in cases of gun-shot wounds, are not only exempt from particular danger, but are often useful. The loss of the limb cannot be taken into the account; for, the surgeon only undertakes the operation where he designs to save the patient's life by that privation, and anticipates that the part itself cannot be preserved. Even, if he should deprive the patient of a limb, that, perhaps, might have been preserved, there is this atonement, that he can furnish him with an artificial leg, which often proves far more serviceable, than the lost limb would have proved, had it been preserved. Should the operation be fixed on, it is to be immediately performed above the wound. (*Richter's Anfangsgrunde der Wundarzneykunst, Band* 1.)

When a cannon-ball has torn off a limb, some advise the amputation of the stump, to procure the patient an even smooth incision, instead of an irregular, jagged, and highly dangerous wound. As the limb has commonly suffered a violent concussion, is almost bereft of sense, and power of motion, and the bone frequently has a fissure extending some way upward, the amputation is also recommended to be done, if possible, above the nearest joint. Others condemn the operation in this instance, asserting, that such wounds may sometimes be healed, and that the constitution, immediately after such violence, is not in a favourable state for submitting to such a painful measure. But, as when the operation is not done, this kind of injury requires large and free incisions, for the extraction of foreign bodies, the shortening of projecting muscles and tendons, the discharge of extravasated fluids and abscesses; and, as these incisions are likely to occasion at least as much irritation as amputation itself, without being productive of equal good, the last objection is not very weighty. The occasional healing of such wounds only proves, that it is not altogether impossible, in certain instances, to effect a cure without amputation. The surgeon can the more readily make up his mind to amputate in this case, as it does not occasion the loss of a limb. No one would be justified in amputating above the knee, when the limb is injured at the foot or ankle. In a section of this article, I shall presently introduce the opinions of M. Larrey and the most eminent military surgeons on the important subject of amputation in gun-shot wounds. We shall there find the last sort of case particularly specified as demanding the *immediate* performance of the operation.

When amputation is deemed unnecessary, the surgeon, according to customary precepts, is to enlarge the wound by incisions. Many of the missile weapons employed by the ancients, when received into the body, required incisions before they could be extracted; and this was the case, not only with regard to darts and arrows, but also with regard to bits of stone, pieces of iron, and leaden bullets, which were thrown by means of slings. Celsus mentions the necessity of enlarging the orifices through which these bodies had entered, and may therefore be justly regarded, as the first who recommended the practice of dilatation in the treatment of wounds made by leaden bullets. (*Thomson's Reports of Obs. in the Military Hospitals of Belgium, p.* 39.)

Such a dilatation has been said to have numerous advantages; to facilitate the extraction of foreign bodies; to occasion a topical bleeding, and afford an outlet for the extravasated fluid in the circumference of the wound; to convert the fistulous form of the track of the ball into an open wound; and, lastly, to divide ligamentous aponeuroses, which otherwise might give rise to spasmodic and other untoward symptoms.

More modern experience shews, however, (*Hunter, p.* 529.) that the utility of such incisions has been overrated; that they generally increase the inflammation, which, in these cases, is so much to be apprehended; that wounds which are not dilated, commonly heal more speedily, than others which are; and, that there are only a few cases, in which incisions are beneficial.

The injuries arising from the practice of indiscriminate dilatation (says Dr. Thomson) were very early pointed out by Botallus; and it is singular, how much the opinions of this author, with regard to this point in military surgery, coincide with those of Mr. Hunter. (*Op. cit. p.* 40.)

The cases of gun-shot wounds are various. Sometimes the track of the ball lies superficially under the skin, and only has one opening. When it lies in soft parts, and the ball has neither touched a bone, nor a considerable blood-vessel, all incisions are useless, let the wound have one or two apertures. Though dilating the wound has been practised with a view of giving vent to matter, eschars, and foreign bodies, and even its whole track has been laid open, when superficial; yet, experience proves the inutility of such steps. As in the skin there is a real loss of substance, arising from a portion being driven inward before the ball, it follows, that the opening of a gun-shot wound must be more capacious than that of a punctured one. By the separation of sloughs, the wound becomes still more dilated, so that not only matter, but foreign bodies which approach the skin, easily find an exit. Besides, incisions commonly close again very soon, and in a few days the wound falls into the same state, as if no dilatation at all had been made.

In gun-shot wounds, ligamentous fibres, and fasciæ, are often found going quite across them. It is advised to divide such parts completely, lest, when the wound inflames, they should cause violent spasms and nervous symptoms, and afterwards impede the discharge of matter and foreign bodies. No doubt this counsel is judicious. However, it is frequently difficult, at first, to discover and divide such parts, and then it is better to defer the incision until one can easily get at them without irritating the wound, and until it is manifest, that their remaining undivided is the cause of inconvenience. These remarks are, also, applicable to membranous expansions perceptible at the sides of the wound, and to entire fasciæ, stretched over the inflamed muscles.

The extraction of foreign bodies ranks as one of the most urgent motives for the dilatation of the wound, and, no doubt, it is right to remove, at first, as many of them as possible. Their lodgment irritates the wound, causes violent nervous and inflammatory symptoms, and copious suppuration; circumstances which the timely extraction of them may prevent. Yet, let it be remembered, that the extraction of foreign bodies is frequently attended with immense irritation, and that, while they lie too firmly fixed in parts, it is often a matter of impossibility. After the sloughs have separated, and the wound has become widened, suppuration frequently does not prevail long before the extraneous substances become loose, spontaneously approach the skin, and easily admit of removal without any dilatation. In cases, where, from necessity, foreign bodies have not been removed at first, no disadvantages have occasionally resulted from their continuance.

Hence, it is prudent, at first, to extract only such foreign bodies as are near the external opening, quite loose, and removeable without much irritation; or such as press on parts of importance, and, thereby excite dangerous symptoms. The surgeon should avoid interfering with those which are deeply and firmly lodged in the wound. He should await suppuration, and the detachment of sloughs, and when the foreign bodies become moveable and apparent, he should extract them, with or without an incision, as circumstances may demand. The examination of the wound ought to be made as much as possible with the finger, which irritates less, and feels more distinctly, than a probe. A great variety of instruments have been devised, either for ascertaining the position of balls, and other foreign bodies in gun-shot wounds, or for extracting them. But, however numerous and diversified bullet-drawers may be, they all admit of being divided into three kinds. The first are constructed on the principle of a pair of forceps. Others are shaped more or less like spoons. And a third description are made on the plan of a cork-screw or worm. These last are only designed for cases, in which the ball is fixed in the substance of a bone, and is quite immoveable; for, if it were lodged in the soft parts, the pressure, requisite for introducing the screw into it, would injure and lacerate the parts at the bottom of the wound. Bullet-drawers, constructed on the plan of forceps, have the inconvenience of not being adapted for seizing the ball, unless their blades are expanded, which always stretches the wound, and creates a great deal of irritation. Forceps have been contrived with blades, which can be introduced separately, and then joined together with a screw. I do not know, whether there is any such instrument, that will grasp a ball, without being first expanded; but, it might easily be made, and would be found advantageous in military practice. Perhaps, when a ball lies superficially, the fingers, or a small pair of forceps, will serve to extract it most conveniently. In many other examples, bullet-drawers, constructed on the principle of a spoon, are the best, that can be used. Richerand speaks of a superior instrument, for the extraction of balls, as follows: "De tous ces instrumens, le meilleur sans doute, est celui de mon illustre collègue dans la chaire de Pathologie Chirurgicale, M. Percy, ce chef si distingué de la chirurgie militaire. Son tireballe offre la réunion des trois genres; il remplit à la fois l'office de pinces à forceps, de cuillier, et de tirefond." (*Nosographie Chirurgicale, Tom.* 1, *p.* 223, *Edit.* 2.)

The event of the treatment above recommended, is various. Extraneous substances remaining in the wound, either loosen gradually, and come into view so as to be easily removeable; or they continue concealed, prevent the cure, and give birth to a fistulous ulcer. In some instances, the wound closes, and the foreign bodies remain in the limb during life, without inconvenience; and, in other cases, after a time, they bring on a renewal of inflammation and suppuration. Sometimes a foreign body varies its situation, sinking down, and afterwards making its appearance at a different part, where it may excite inflammation and suppuration.

When the ball lodges in the wound, it is usually difficult to trace it, as the parts collapse after its passage. The ball does not regularly take a straight direction through the injured part, but, oftentimes, a very tortuous one. The latter circumstance is more apt to occur, when the ball is nearly spent. In every case, in which it is not easily discoverable, all painful examinations should be abandoned, and the foreign body left in its situation, where it rarely creates any trouble.

Sometimes, the ball may be both easily found and extracted. At other times it lodges on the opposite side of the limb, closely under the skin. If the integuments, under which the ball is lodged, should be so contused that they will probably slough, they are to be considered as already dead, and an opening is to be made in them for the extraction of the ball. But when the ball lies so remotely from the skin that it can only just be felt, and the skin itself is quite uninjured, no counter-opening ought to be made. The wound heals better when the ball is left in, and far less inflammation takes place in the vicinity of this extraneous body, than about the orifice of the wound. A counter-opening always renders the inflammation at the bottom of the wound, as great as at its orifice. It is better to let the wound heal up, and extract the ball afterwards. (See *Hunter, p.* 541.)

Sometimes the ball penetrates the spongy part of a bone, and lodges firmly in it. When it has only entered superficially, it may sometimes be loosened and extracted, by means of an elevator with a thin and somewhat curved extremity, and when it is more firmly fixed, a screw bullet-drawer will sometimes serve for its removal. Should the attempt fail, hope may still be entertained, that, when suppuration takes place, it will become loose, and admit of extraction. In case nothing of this kind should occur, some advise the employment of a trepan to remove the ball from its situation. As this cannot be done without great irritation, and experience proves that a ball may lie in a bone during life, without occasioning unpleasant symptoms, it is obviously preferable to allow it to remain. (*Richter's Anfangsgr. der Wundarzn. Band* 1.)

Besides these principal circumstances, there are various contingent ones, which often demand a particular mode in making the incisions, and in the subsequent management. To explain them all here is impossible. Hemorrhage from a torn artery of considerable magnitude, for which a ligature is necessary, may require incisions to get at the vessel.

As soon as the requisite incisions are made, and foreign bodies extracted, the prime objects in the treatment of gun-shot wounds are then accomplished, and the rest is, in reality, not different from the surgery of other wounds.

With regard to probing gun-shot wounds; when it is evident that the shot has passed out, and no particular object can be fulfilled by introducing an instrument, it is often better to dispense with such examination, at least till suppuration has come on. Introducing any instrument is generally productive both of pain and irritation. But when the ball, or any other extraneous substance, has lodged in the wound, and its situation is not immediately evident, it will often be advisable to search for it at once, in order that if its situation will allow, it may be extracted before inflammation begins. The surgeon, therefore, considering all the circumstances which can assist him in forming a reasonable conjecture of the course of the wound, must give to a probe that curvature, or form, which he thinks most likely to pass readily along it, and must then proceed to make the examination. But, when this is very painful, and the course of the wound obscure, it will often be better to desist, and renew the search when suppuration has taken place, when it can be undertaken with more ease, and a greater prospect of success. When gun-shot wounds are inflamed, the tenderness and swelling of the parts are peculiarly strong reasons against painful probings, or efforts to extract foreign bodies, as long as this state lasts. (See *Chevalier's Treatise on Gun-shot Wounds, p.* 67, 68, *Edit.* 3.)

There is no fact in the practice of surgery better established, than that the cramming of narrow stabs and gun-shot wounds with lint is particularly hurtful. The only possible reason for doing so in the latter cases must be to keep the orifice of the wound from healing up, and confining extraneous bodies, matter, &c. The apprehension of this happening at first is quite unfounded; for the inside of the mouth of the injured part is lined with a slough or eschar, which must necessarily be detached before the parts can heal. The first dressings, therefore, should be quite superficial, and of a mild unirritating nature. On the field of battle, indeed, it would be well for many of the wounded, if the surgeon were to content himself with applying simple pledgets, and covering the part with linen wet with cold water. This method would prove much more beneficial, than the hasty and indiscriminate use of adhesive plasters, sutures, and tight bandages, from the bad effects of which thousands of soldiers have lost limbs, or lives, which, under more judicious treatment, might have been saved. Hunter used to employ fomentations, pledgets of simple ointments, and, frequently, over the latter an emollient poultice. In the suppurative stage of gun-shot wounds, poultices are also the best applications, and a little piece of lint may be gently introduced into the mouth of the wound in order to preserve an outlet for the matter, extraneous bodies, and sloughs, which are making their way outward.

Possessing these ideas, I cannot altogether approve the following directions, though they are certainly better than are given in many surgical books. "A small bit of soft lint may be placed lightly between the lips of the wound, *in order to keep it from closing.* In some instances, it should be introduced a little beyond the lips, *in order to conduct off the fluids effused, and to prevent irregular adhesions from forming near the surface during the inflammatory stage;* as these would impede the direct exit of the discharge. But the wound is not to be filled with lint, much less crammed with it. A pledget of some simple ointment being then laid on, with tow or cloths to receive the discharge, and these prevented from coming off by a bandage loosely applied, the patient may be put to bed, and so placed, if possible, as to keep the orifice of the wound dependent." (*Chevalier, p.* 125, 126.) The reasons for what I consider objectionable, namely, introducing lint on first dressing the wound, are too frivolous to need comment.

When the track of the ball has two apertures, some advise a seton to be drawn through it, with a view of preventing a premature closure of the wound, and introducing proper applications. A seton is, also, imagined to give free vent to pus, and to promote the evacuation of foreign bodies. But a gun-shot wound is little inclined to close prematurely, and a seton rather obstructs the exit of pus, and may as easily push foreign bodies deeper, into the limb, as out of it. There are preferable modes of applying the necessary remedies, and, as a seton is an extraneous substance itself, its employment must be deemed pernicious.

Gun-shot wounds require, in general, the employment of antiphlogistic means, just as other cases attended with equal inflammation do. When they are in the inflamed state, the application of leeches is highly proper.

Bleeding is recommended in these cases, and in such a manner as, if it were of more service in them than wounds in general. But the necessity for the practice is really not greater than in other wounds which have done the same degree of mischief, and from which the same quantity of inflammation and other consequences are expected. Bleeding is certainly proper here, just as it is in all considerable wounds attended with a strong full habit, and great chance of extensive inflammation, and much symptomatic fever. In every instance, however, the practitioner must take particular care not to be too bold in the practice of bleeding; for when the patient is reduced below a certain degree, his strength is inadequate to support the large and long-continued suppurations which often cannot be avoided. (See *Hunter, p.* 563, 564.)

As the orifices of the vessels torn by the ball are compressed, and, as it were, obliterated, considerable hemorrhage is seldom remarked at first. But, after some days, and frequently at a very late period, when the sloughs separate, copious hemorrhages are apt to occur, which are the more dangerous as they come on unexpectedly, and, oftentimes, when the suppuration has already induced great debility. A sense of heaviness, throbbing, and plethora, at the wounded part, often announces the approach of such an event. The surgeon himself may occasion the bleeding, by removing the dressings carelessly. Hence, in every case, where there is reason to apprehend from the situation of the wound, that a considerable vessel is injured, the patient must be constantly and attentively watched, and every thing necessary for the immediate stoppage of the hemorrhage must be provided.

Another kind of hemorrhage, still more dangerous than the former, particularly occurs in such gun-shot wounds, as have long been in a state of copious suppuration. The blood does not issue from one individual vessel, but from the whole surface of the wound, as from a sponge, and is so thin as to resemble blood and water. This hemorrhage is very dangerous, because it is particularly apt to exhaust the patient, who is already extremely debilitated, and its causes are difficult of removal. The case demands the exhibition of bark, alum, and diluted sulphuric acid. Decoctions of bark, and muriatic acid, may, at the same time, be applied to the wound. (*Richter.*)

Sometimes, in gun-shot wounds, the inflammation lasts very long, and there is no appearance of suppuration. In other instances, fresh inflammation comes on suddenly, during the suppurative stage, without any evident cause, and puts a stop to the secretion of matter. Sometimes the wound suppurates in an extraordinary degree, without any perceptible reason. All these circumstances often depend on splinters of bone remaining behind, which should be extracted as soon as it is practicable. (*Richter.*)

For the first days, the matter seldom assumes a healthy appearance; but as soon as the sloughs separate, it then becomes of a proper quality, and the wound is to be treated as a simple abscess.

Sometimes the healing process does not commence, after suppuration has prevailed for a considerable time. On the contrary, notwithstanding the exhibition of tonics, and a generous diet, the suppuration ceases to proceed favourably, and the wound becomes unhealthy, and the matter thin. The bones shew no disposition to unite, and the patient, reduced by hectic symptoms, is rapidly advancing to dissolution. In this state, life may sometimes be preserved by amputation; the *anceps*, but *unicum remedium.* We ought never to be deterred from undertaking the operation by the fever and weakness, which frequently soon disappear when the local cause is removed.

### OF AMPUTATION IN CASES OF GUN-SHOT WOUNDS.

The 2nd edition of this dictionary, published in 1813, contained all the valuable observations of M. Larrey, in favour of *immediate* amputation in every instance, in which the operation is considered indispensable. Since then, the public have been favoured with several good practical books, in which the propriety and necessity of early or immediate amputation in such cases are urgently inculcated, and the truth of the doctrine illustrated by additional facts. It is to be observed, however, that for nearly two hundred years past, there have always been some advocates for this judicious practice. "Du Chesne (says Dr. J. Thomson) is the first writer on military surgery, in whose works I have found the recommendation to amputate in the severer injuries of the extremities; and, it is worthy of remark, that *he directs the operation to be performed before inflammation and other constitutional symptoms* shall have supervened." (See *Traité de la Cure generale et particulière des Archusades. Par Jos. Du Chesne; Paris,* 1625, *p.* 143; *and Thomson's Report &c. p.* 160.) Wiseman not only recommended and practised immediate amputation; but the same thing was not unfrequently done by the military surgeons of his time. (*Chirurgical Treatises, by R. Wiseman, 3d edit. London,* 1696, *p.* 410.) The celebrated Le Dran, in his excellent little manual of military surgery, declared himself an advocate for *immediate* amputation in all cases, in which that operation from the first appears to be indispensable. Le Dran has at the same time stated briefly but most distinctly, the comparative advantages of that practice, with those which may be expected from delay. (See *Traité où Réflexions tirées de la Pratique sur les Plaies d'Armes à feu. Par H. F. Le Dran, à Paris*, 1737.) Ranby, who was serjeant surgeon to King George II. entertained similar opinions to those of Le Dran, with regard to the utility of immediate amputation. In order to give immediate relief to the wounded, and to facilitate the performance of the necessary operations, Ranby proposed, that the surgeons during battle, should be collected into small bodies, and stationed in the rear of the army. (See *the Method of treating Gun-shot Wounds. By John Ranby. Edit.* 3. *p.* 29, *London* 1781.)

After the battle of Fontenoy, in the year 1756, the Royal Academy of Surgery in France offered a prize for the best dissertation on the gun-shot injuries requiring immediate amputation, and on other cases of the same nature, where the operation, though deemed inevitable, might be delayed. "*L'amputation étant absolument nécessaire dans les playes compliquées de fracas des os, et principalement celles qui sont faites par armes à feu, déterminer les cas où il faut faire l'opération sur le champ, et ceux où il convient de la différer, et en donner les raisons.*" The prize was adjudged to the dissertation of M. Faure, the main object of whose paper was to recommend delaying the operation. The side of the question espoused by M. Faure has found some modern advocates of distinguished talents and celebrity. Suffice it to mention the names of Hunter, Baron Percy, and Lombard. It is however only justice to M. Faure to state in this place, that, though he regarded immediate amputation as full of danger, he admitted, that there were several kinds of injuries of the extremities, in which it was indispensably and immediately required. "The enumeration (says Dr. Thomson) which this author has given of these injuries is more full and distinct, than any which had been published before his time; and, what may appear singular, *it does not differ, in any essential respect, from the enumerations given by later writers*, who in combating his opinions, have represented him as an enemy to amputation in almost all injuries of the extremities." (See *Report of Observations made in the Military Hospitals in Belgium, p.* 169.)

In 1792, M. Percy, now at the head of the medical department of the French army, published a book, in which he gives a preference to delaying amputation at first, even in cases where it is certain, that the operation cannot ultimately be dispensed with. (See *Manuel de Chirurgien d'Armée.*) Even as late as 1804, Lombard, Professor in the Military Academy of Strasburgh, defended the doctrines of M. Faure. (See *Clinique Chirurgicale des Plaies faites par armes à feu.*)

Although in France, the academy of surgery thought proper to decree the prize to M. Faure, whose doctrine thus received the highest approbation, yet, in that country, very opposite tenets were set up by some men of distinguished talents and extensive military practice. Thus Le Dran, consulting surgeon to the French army, in his work on gun-shot wounds, published in 1737, expressly states, "That when the amputation of a limb is indispensably necessary in the case of a gun-shot wound, it ought to be done without delay." (*Aphorism* 9.) M. La Martinière in particular also wrote some excellent arguments in reply to M. Bilguer; arguments, which, I think, would do honour to the most accomplished surgeon of the age, in which we live. (See *Mémoire sur le traitement des plaies d'armes à feu, in Mém. de l'Acad. de Chirurgie, Tom.* 11, *p* 1, *Edit. in* 12*mo.*) M. Boucher, of Lisle, was an advocate for the same side of the question. (See *Obs. sur des plaies d'armes à feu, &c. in Mém. de l'Acad. de Chirurgie, Tom.* 5, *p.* 279, *&c Edit. in* 12*mo.*) Schmucker, who was many years surgeon-general to the Prussian armies, published in 1776 an essay on amputation, in which he particularly mentions, that, during his stay at Paris in 1738, the surgeons of the Hôtel-Dieu had been in the habit of performing immediate amputation in severe injuries of the extremities. *He also declares himself an advocate for operating immediately, in all cases in which amputation from the first appears to be necessary*, and insists, in a particular manner, on the increased danger, which he had seen arise from the operation during the second period. He gives (as Dr. J. Thomson has observed) a minute and circumstantial enumeration of those injuries, both of the upper and lower extremities, in which he conceived amputation to be necessary, and in many of which he had actually performed it with great success. Schmucker appears to Dr. Thomson to have given a better account, than any preceding military surgeon, of the injuries of the thigh; and, from the results of his experience, he was led to believe, that *though compound fractures of the lower part of the thigh-bone might, in favourable circumstances, be cured without amputation, yet that this operation is peculiarly necessary in all cases, in which the fracture is situated in, or above, the middle of that bone.* (See *Untersuchung über die Abnehmung der Glieder von J. L. Schmucker. Vermischte Chirurgische Schrifter, Band* 1. *Berlin*, 1785.) With the foregoing high authority we have to join one of not less celebrity, namely, that of M. Larrey, who has proved most convincingly, that when amputation is to be done in cases of gun-shot wounds, nothing is so pernicious as delay. (See *Mé-*

*moires de Chirurgie Militaire, Tom.* 2, *p.* 451, &c.)

It becomes me here to state, also, that the principles, inculcated by M. Larrey, are, in point of fact, the same as those, which were so strenuously insisted upon by Mr. Pott, whose principal remarks on the necessity of amputation in certain cases, are detailed in another part of this publication. (See *Amputation.*) Mr. Pott, indeed, was not an army surgeon, and what he says, was not particularly designed to apply to military practice; but, he has represented, as well as any body can do, the propriety of immediate amputation for injuries, which leave no doubt, that such operation cannot be dispensed with.

Mr. John Bell, amongst the moderns, appears to me likewise to have much merit, for the able manner in which he defended the propriety of early amputation, long before the sentiments of later writers were ever heard of. He distinctly states, that "amputation should, in those cases where the limb is plainly and irrecoverably disordered, be performed upon the spot." (See *Discourses on the Nature, &c. of Wounds, p.* 488, *edit.* 3.) Indeed, notwithstanding all the modern pretensions to novelty upon this interesting topic, we must acknowledge, with Dr. Thomson, that the evidence in favour of the advantages of immediate amputation has always preponderated over that for delay. (See *Report of Obs. made in the Military Hospitals in Belgium, p.* 225.)

The strongest body of evidence upon this matter, is undoubtedly adduced by M. Larrey, whose situation at the head of the medical department of the French armies afforded him most numerous opportunities of judging from actual experience. "Upon this subject, (says he) now that twenty years of continual war have carried our art to the highest pitch of perfection, there can only be one opinion. It is after having incessantly directed the medical service, all this time, in quality of head surgeon and inspector-general of the armies, that I proceed to discuss the different opinions delivered in the academy, and to settle definitively this great question, which I regard as the most important in military surgery.

"If we are to be told, that the amputation of a limb is a cruel operation, dangerous in its consequences, and always grievous for the patient, who is thereby mutilated; that, consequently, there is more honour in saving a limb, than in cutting it off with dexterity and success; these arguments may be refuted by answering, that amputation is an operation of necessity, which offers a chance of preservation to the unfortunate, whose death appears certain under any other treatment; and, that if any doubt should exist of amputation being absolutely indispensable to the patient's safety, the operation is to be deferred, till nature has declared herself, and given a positive indication for it. We are also justified in adding, that this chance of preservation is at the present day much greater, than at the epoch of the academy of surgery We learn from M. Faure, that, of about three hundred amputations, performed after the battle of Fontenoy, only thirty were followed by success, whilst, on the contrary, says M. Larrey, we have saved more than three-fourths of the patients, on whom amputation has been done, and some of whom also had two limbs removed. This improvement is ascribed by M. Larrey, 1st, to our now knowing better how to take advantage of the indication and favourable time for amputating. 2. To the dressings being more methodical. 3. To the mode of operating being more simple, less painful, and more expeditious, than that formerly in vogue."

To the preceding authorities against delaying amputation, in cases of gun-shot wounds requiring such operation, we have lastly to add that of Mr. Guthrie, deputy inspector of military hospitals, whose opportunities of observation, during the late war in Spain, were particularly extensive. In his work, he has detailed the opinions of many eminent foreign and British surgeons, respecting the propriety, or impropriety, of the doctrine of immediate amputation; and he has introduced some good criticisms, particularly on Bilguer's statement of the success which was experienced in the Prussian hospitals, from not performing the operation. Mr. Guthrie, however, does not recommend amputation to be done immediately, if the patient be particularly depressed by the shock of the injury directly after its receipt. "If a soldier, at the end of two, four, or six hours, after the injury, has recovered from the general constitutional alarm, occasioned by the blow, his pulse becomes regular and good, his stomach easy, he is less agitated, his countenance revives, and he begins to feel pain, stiffness, and uneasiness in the part: he will now undergo the operation with the greatest advantage, and, if he bears it well, of which there will be little doubt, he will recover in the proportion of nine cases out of ten in any operation on the upper extremity, or below the middle of the thigh, &c. If, on the contrary, the operation be performed before the constitution has recovered itself, to a certain degree, from the alarm it has sustained, the additional injury will most probably be more than he can bear, and he will gradually sink under it and die." (*On Gun-shot Wounds, p.* 24, *London,* 1815.) As far as my experience goes, however, all delay is improper when the necessity of amputation is undoubted, at least all delay beyond the short period, during which the faintness immediately arising from the injury usually lasts. In the campaign in Holland, 1814, the most successful amputations were those done in the field hospitals directly after the arrival of the patients. On this point, I am inclined to agree, with a modern writer, of whose practice in another case, viz. erysipelas, I do not entertain so favourable an opinion. (See *Hutchison's Practical Observations on Surgery.*) It appears from some returns, collected by Mr. Guthrie, that in the peninsula, the comparative loss, in secondary or delayed operations, and in primary, or immediate amputations, was as follows:

| | Secondary. | | Primary. |
|---|---|---|---|
| Upper extremities - | 12 | to - | 1 |
| Lower extremities - | 3 | to - | 1 |

The great success attending amputation on the field of battle was also convincingly proved after the battle of Toulouse. Here of 47 immediate amputations, 38 were cured, while of the 51 delayed operations, on that occasion, 21 had fatal terminations. (*P.* 42—44.)

### OF IMMEDIATE AMPUTATION.

When a limb, that has received a gun-shot wound, cannot be saved, amputation should be immediately practised. The first four and twenty hours, as M. Larrey observes, are the only time that nature remains tranquil, and we must hasten to take advantage of this period, in order to administer the necessary remedy.

In the army, a variety of circumstances make the urgency for amputation still greater. 1. The inconvenience attending the transport of the wounded, from the field of battle to the military hospitals, in carriages badly suspended, the jolting of which would produce such disorder in the wound, and in the whole body, that most patients would die in the journey, especially if it were long, and the weather either extremely hot or cold.

2. The danger of a long continuance in the hospitals; a danger, which amputation materially diminishes, by changing a gun shot injury into a wound, that may be speedily healed, and reducing the causes of fever, and the hospital gangrene.

3. The cases, in which there is a necessity for abandoning the wounded. In this circumstance, it is of importance to have amputated, for, after the operation, the patients may remain some days without being dressed, and the dressings are afterwards more easy. Besides, it might often happen, that these unfortunate objects would not meet with surgeons of sufficient skill to do the operation; a circumstance, says M. Larrey, that we have seen happen among certain nations, whose caravans, for the medical service of the army (*ambulances*), are not constructed like those in use with the French.

### OF CASES, IN WHICH AMPUTATION SHOULD BE DONE IMMEDIATELY.

*First case.* A limb carried away by a cannon-ball, or the explosion of a howitzer, or bomb, requires amputation without any loss of time: the least delay puts the patient's life in danger.

In this case, the necessity of the practice is inculcated by M. Faure himself, as well as by Schmucker, Richter, Larrey, Dr. Thomson, and every modern writer upon gun-shot wounds.

The skin has been violently stretched and lacerated; the muscles have been ruptured and irregularly torn away; the tendons and aponeuroses lacerated; the nerves and vessels divided and forcibly dragged; lastly, the bones broken and smashed to a greater or lesser extent. These first effects are followed by a general, or partial commotion; by a kind of torpor in the injured part, and a good way above the wound; by a painful trembling in the remains of the member, an event, that is singularly afflicting to the patient; and by a local swelling preceding the erethismus, which quickly shews itself. The hemorrhage, says M. Larrey, an accident much more to be apprehended, than has been supposed, often comes on a few moments after the injury, and, if prompt succour were not afforded, would put a period to the patient's existence. "I can even declare, that, had it not been for the activity of the train of flying surgical carriages (*ambulances volantes*) by means of which the wounded have always been dressed upon the field of battle, many soldiers would have perished from this accident alone."

If the operation is not speedily done, pain commences, fever occurs, and the functions become disordered; the irritation then increases, and convulsive motions take place. If the patient should not be a victim to these first symptoms, (continues Larrey) the solids, after having been distended in an inordinate degree, fall into a complete atony, and hence, gangrene of the stump is occasioned, the fatal consequences of which it is extremely difficult to prevent.

After this short exposition, it is easy to see, that, in this case, amputation ought to be practised immediately, and to delay the operation, and merely apply simple dressings, would be affording time for the preceding accidents to arise.

At Strasburgh, during the bombardment of the Fort of Kell, in 1792, three volunteers, says M. Larrey, had limbs shot off by the explosion of shells; one, an arm; another, a fore-arm; and the third a leg. They were conveyed to the hospital for the wounded in that town, which was superintended by M. Boy, surgeon of the first class. Several days were suffered to elapse before amputation was performed: not one of the patients escaped.

At Mentz, after the retreat from Frankfort, M. Larrey acquaints us, that several of the wounded, who had had limbs shot off, did not have amputation done till some time afterwards, and not one of them recovered.

At Nice, after the taking of Saourgio, two amputations were practised at the hospital, No. 2; one of the fore-arm, the other of the arm, nine or ten days after the receipt of the injuries: both the patients died.

At Perpignan, in the hospital Brutus, M. Larrey visited two soldiers, on whom amputation had been done, seven or eight days after the receipt of gun-shot injuries in the action of the 14th of July, 1794. One had a leg shot off, and the other, his right arm. Notwithstanding M. Larrey's utmost care, he could not save their lives: one died of tetanus, the other of gangrene.

In the month of August, 1805, two cannoniers of the guards, in discharging the artillery, had each a hand shot away, and all the forepart of their bodies burnt. These were the two men, whose office it was to charge the gun. At the moment, when they had just rammed down the wadding on the cartridge, a spark, that had been left unextinguished, from the neglect to keep the touch-hole closed, set fire to the powder: the ramrod was violently repelled by the explosion, together with every thing that was situated in front of the charge. The right hand of one of the cannoniers was completely torn off, between the two phalanges of the carpus, and thrown more than two hundred paces. The counter shock even threw the man down into the ditch of the square of the Hôtel des Invalides. The left hand of the other cannonier was torn away, together with the fore-arm at the elbow-joint, and also forced to a considerable distance. The tendons and muscles sustained vast injury from the violent manner in which the limbs were torn away, and the worst symptoms would have occurred, if amputation had not been instantly performed. But, as M. Larrey happened to be at the hospital, when these two soldiers were brought thither, he operated upon them immediately. In one, amputation was done at the wrist; and, in the other, at the lower third of the arm. The two operations were followed by complete success, although the burns upon the face and chest, in both the patients, were serious and extensive.

*Second case.* When a body, propelled by gunpowder, strikes a limb, in such a manner, as to smash the bones, violently contuse, lacerate, and deeply tear away, the soft parts, amputation ought to be immediately performed. If this measure be neglected, all the injured parts will soon be seized with gangrene: and besides, as M. Larrey has explained, the accidents, which the gravity of the first case produces, will also here be excited. It is only doing justice to the memory of M. Faure to state, that this second case was one, which he also particularly instanced as demanding the immediate performance of amputation. (See *Prix de l'Acad. Royale de Chirurgie, T.* 8, *p.* 23, *Edit.* 12*mo.*)

*Third case.* If a similar body were to carry away a great mass of the soft parts, and the principal vessels of a limb, (of the thigh, for instance), without fracturing the bone, the patient would be in a state demanding immediate amputation; for, independently of the accidents, which would originate from a considerable loss of substance, the limb must inevitably mortify. Mr. Guthrie also says, "a cannon shot destroying the artery and vein, on the inside (of the thigh) without injuring the bone, requires amputation." (*P.* 185.) When, however, the femoral artery, or vein, is injured by a musket ball, or small cannister shot, this gentleman recommends tying the vessel above and below the wound in it, if the nature of the case be evinced by hemorrhage. But, he believes, that when both vein and artery are injured, amputation is necessary, (*P.* 186.)

"An injury of the femoral artery (observes Mr. Guthrie) requiring an operation, accompanied with fracture of the bone of the most simple kind, is a proper case for immediate amputation; for, although many patients would recover from either accident alone, none would, I believe, surmount the two united, and the higher the accident is in the thigh, the more imperious is the necessity for amputation." (*Guthrie on Gun-shot Wounds, p.* 187.)

*Fourth case.* A large biscayen strikes the thick part of a member, breaks the bone, divides and tears the muscles and destroys the large nerves, without, however, touching the main artery. According to M. Larrey, this is a fourth case, requiring immediate amputation.

Mr. Guthrie seems to coincide on this point with M. Larrey: "If a cannon shot strike the back part of the thigh, and carry away the muscular part behind, and with it the great sciatic nerve, amputation is necessary, even if the bone be untouched; &c. In this case, I would not perform the operation by the circular incision, but would preserve a flap from the fore part, or sides, as I could get it, to cover the bone, which should be short." (*Guthrie on Gun-shot Wounds of the Extremities, p.* 184.)

*Fifth case.* If a spent cannon-shot, or one that has been reflected, should strike a member obliquely, without producing a solution of continuity in the skin, as often happens, the parts, which resist its action, such as the bones, muscles, tendons, aponeuroses, and vessels, may be ruptured and lacerated. The extent of the internal disorder is to be examined; and if the bones should feel, through the soft parts, as if they were smashed, and if there should be reason to suspect, from the swelling, and a sort of fluctuation, that the vessels are lacerated, amputation ought to be immediately practised. We learn from M. Larrey, that this is also the advice of M. Percy, an eminent French army surgeon. Sometimes, however, the vessels and bones have escaped injury, and the muscles are almost the only parts disordered. In this circumstance, we are enjoined to follow the counsel of M. La Martinière, who recommended making an incision through the skin. By this means, a quantity of thick blackish blood will be discharged, and the practitioner must await events. According to M. Larrey, such incision is equally necessary in the preceding case, before amputation, in order to ascertain the extent of the mischief, which the parts have sustained.

It is to such injury, done to internal organs, that we must ascribe the death of many individuals, which was for a long while attributed to the commotion produced by the air put in motion by the ball, when this, in grazing upon different parts of the body, alters them, or cuts off the column of air, which is to serve for respiration, just at the moment when it is about to enter the chest. (See *Ravaton's Traité des Plaies d'Armes à Feu.*)

Although, observes M. Larrey, this opinion has been sanctioned by surgeons of high repute, we may easily convince ourselves of its falsity, if we carefully consider, 1st, the direction and course of solid hard bodies, and their relation to the air, through which they have to pass; 2dly, the internal disorder, observable in the dead bodies of persons, whose death is imputed to the mere impression of the air, agitated by the ball; 3dly, the properties of the elastic substances, such as the integuments, cellular substance, &c. struck by the shot.

It is universally agreed amongst philosophers, that a solid body, moving in a fluid, only acts upon a column of this fluid, the base of which column is nearly equal to the surface, which the solid body presents. (See *Le Vacher sur quelques particularités concernant les playes faites par armes à feu, in Mém. de l'Acad. de Chirurgie, Tom.* 11, *p.* 34, *Edit. in* 12*mo.*)

Thus a cannon-ball, in traversing a space equal to its diameter, can only displace a portion of air, in the relation of 3 to 2, compared with the size of the shot. This fluid, in consequence of its divisibility and homogenealness with the ambient air, is dispersed in all directions, and confounded with the total mass of the atmosphere. The effects of this aeriform substance amount to nothing, and not a doubt can be entertained, that if there is the slightest solution of continuity of any part of the body, it must depend upon the direct action of the ball itself.

If, besides, the quickness of the motion of a ball be considered, which quickness is known to diminish in an inverse ratio to the squares of the distance, it will be seen, that the space, through which the shot has passed, before striking the object, against which it was directed, will already have materially lessened the celerity of the projectile, while the motion of the column of air must be totally lost.

They who espouse the opinion, against which M. Larrey has written, found their argument upon a particular experiment, of which the following is a succinct account. With an air-gun, a ball is projected into a mass of argillaceous soft earth, placed upon a deal board, at two-thirds of the course of the projectile. Instead of a hole of a calibre equal to the ball, a crater is produced in this soft earth, twice, or thrice as wide as the shot, and of an oval shape. These appearances are imputed to the effect of the air forcibly impelled before the ball, the particles of the clay being thrown in all directions, and leaving an excavation accordingly.

But, says M. Larrey, is it not more probable, that this phenomenon is rather owing to the obliquity, which the ball meets with in the two lines, through which it passes, in order to enter, and make its exit from this soft inelastic substance? For, in the first case, the ball has begun its parabola, and, afterwards, the new movement, which the board in consequence of its resistance and elasticity, communicates to the ball, changes the direction of this body, and makes it take a different course. It is to these two angles, more or less open, of incidence and reflection, that, according to M. Larrey, the dispersion of the particles of the argillaceous earth is owing, the effect being increased by the instantaneous projection which the point of the wood, struck by the ball, makes against the clay, by reason of its elasticity, while the particles of this earth itself the more readily sink down again, as they are destitute of any elastic property.

The different movements which the ball describes in its course, and the elasticity of the skin, will now enable us to explain, how internal injuries are produced, without any external solution of continuity, and often even without ecchymosis. The motion communicated to the ball by the power, which projects it, is, for a given space, rectilinear. If, at this instance, it strikes against the body, it carries the part away to an extent proportioned to the mass, with which it touches the part. But, the ball, after having traversed a certain distance, undergoes, in consequence of the resistance of the air, and the attraction of gravity, a change of motion, and now turns on its own axis, in the diagonal direction.

If the shot should strike any rounded part of the body, towards the end of its course, it will run round a great portion of the circumference of the part, by the effect of its curvilinear movement. It is also in this manner, observes M. Larrey, that the wheel of a carriage acts, in passing obliquely over the thigh, or leg, of an individual stretched upon the ground. In this case, the results are the same as those, of which we have been speaking. The most elastic parts yield to the impulse of the contusing body; while such as offer resistance, as, for instance, the bones, tendons, muscles, and aponeuroses, are fractured, ruptured, and lacerated. For the same reason, it sometimes happens, that the viscera are similarly injured.

At first sight, all the parts appear to be entire; but, a careful examination will not let us remain long in doubt about the internal mischief. In this case, an ecchymosis cannot manifest itself outwardly, because the vessels of the skin, which communicate with the internal parts, are ruptured, because the extravasation of blood naturally takes place in the deep excavations, occasioned by the rupture of the muscles and other parts, and because this fluid cannot make its way through the texture of the skin. Such extravasations can only be detected by the touch.

The foregoing reasoning is supported by experience. How often, says M. Larrey, have we not seen the ball carry away pieces of helmets, hats, cartridge-boxes, knapsacks, or other parts of the soldier's dress, without doing any other injury? The same ball, perhaps, takes off his arm, often at a time, when it is closely applied to the body of his comrade, and, yet, the latter does not receive the slightest harm. The shot may pass betwixt the thighs, and these members hardly exhibit an ecchymosis at the points, which are gently grazed; the only example, adds M. Larrey, in which, ecchymosis does occur. In other instances, the ball severs the arm from the trunk, and the functions of the thoracic viscera are not at all injured.

M. Larrey then relates the following case. M. Méget, a captain, marching in the front of a square of men, in the heat of the battle of Altzey, 30th March, 1793, had his right leg almost entirely carried away by a large cannon-shot, without the contiguous limb of his lieutenant, who was as close as possible to him, receiving the least injury. The violent general commotion excited, and the extreme severity of the weather, made this officer's condition imminently perilous. The progress of the symptoms, however, was checked by amputation, which was instantly performed. M. Méget was then capable of being conveyed to the hospital at Landau, fifteen leagues from the field of battle, where he got quite well.

M. Larrey declines relating numerous other analogous amputations, which he has been called upon to practise under the same circumstances. M. Buffy, a captain of the artillery of the army of the Rhine, was struck by a howitzer, his left arm being injured, and his head so nearly grazed, that the corner of his hat, which was placed forwards over his face, was shot away as far as the crown. This officer, the skin of whose nose was even torn off, was not deprived of his senses, and he was actually courageous enough to continue for some minutes commanding his company. At length, he was conveyed to the *ambulance* of M. Larrey, who amputated his arm: in about a month, he was well.

When balls strike parts obliquely, they produce in a lesser degree the effects, which arise from the incomplete collision of a shot: their tortuous course in the substance of a member is subject to curious varieties.

But, to return to the object of our present consideration, M. Larrey expresses his belief, that what have been erroneously termed *wind contusions*, if they are attended with the mischief above specified, require immediate amputation. The least delay makes the patient's preservation extremely doubtful. The internal injury of the member may be ascertained by the touch, by the loss of motion, by the little sensibility retained by the parts, which have been struck; and, lastly, by practising an incision, as already recommended.

In order to confirm the principle, which he endeavours to establish, in opposition to many writers, M. Larrey indulges himself with the following digression.

At the siege of Roses, two cannoniers, having nearly similar wounds, were brought from the trenches to the ambulance, which M. Larrey had posted at the village of Palau. They had been struck by a large shot, which, towards the termination of its course, had grazed posteriorly both shoulders. In one, M. Larrey perceived a slight ecchymosis over all the back part of the trunk, without any apparent solution of continuity. Respiration hardly went on, and the man spit up a large quantity of frothy vermilion blood. The pulse was small and intermitting, and the extremities were cold. He died an hour after the accident, as M. Larrey had prognosticated. This gentleman opened the body, in the presence of M. Dubois, inspector of the military hospitals of the army of the eastern Pyrenees. The skin was entire; the muscles, aponeuroses, nerves, and vessels of the shoulders were ruptured and lacerated, the scapulæ broken in pieces, the spinous processes of the corresponding dorsal vertebræ, and the posterior extremity of the adjacent ribs, fractured. The spinal marrow had suffered injury; the neighbouring part of the lungs was lacerated, and a considerable extravasation had taken place in each cavity of the chest.

The second cannonier died of similar symptoms, three quarters of an hour after his arrival at the hospital. On opening the body, the same sort of mischief was discovered, as in the preceding example.

In the German campaigns of the French armies, M. Larrey met with several similar cases, and accurate examination has invariably convinced him of the direct action of a spherical body, propelled by means of gunpowder.

*Sixth case.* When the articular heads are much broken, especially those which form the joints of the foot, or knee, and the ligaments, which strengthen these articulations, are broken and lacerated, by the fire of a howitzer or by a biscayen, or other kind of ball, immediate amputation, says M. Larrey, is indispensable. According to this experienced writer, the same indication would occur, were the ball lodged in the thickness of the articular head of a bone, or were it so engaged in the joint, as not to admit of being extracted by simple and ordinary means. (See *also Guthrie on Gun-shot Wounds*, *p.* 197.)

Fractures extending into the joints, and accompanied with great laceration of the ligaments, were cases of gun-shot injuries pointed out by M. Faure, as indispensably requiring immediate amputation. (See *Prix de l'Acad. de Chir. T.* 8.) Thus we see, that this author was not so averse to early amputation as several modern writers have represented.

It is only in this manner, that the patients can be rescued from the dreadful pain, the spasmodic affections, the violent convulsions, the acute fever, the considerable tension, and the general inflammation of the limb, which, M. Larrey observes, are the invariable consequences of bad fractures of the large joints. But, adds this author, if the voice of experience be not listened to, and amputation be deferred, the parts become disorganized, and the patient's life is put into imminent peril.

It is evident, says he, that, in this case, if we wish to prevent the patient from dying of the consequent accidents, amputation should be performed before twelve, or at most twenty-four hours, have elapsed: even M. Faure himself professed this opinion, in regard to certain descriptions of injury. (*Mém. de Chir. Militaire, T.* 2.)

With respect to wounds of the knee, the sentiments of Mr. Guthrie nearly coincide with those of M. Larrey. "I most solemnly protest (says Mr. G.), I do not remember a case do well, in which I knew the articulating end of the femur, or tibia, to be fractured by a ball that passed through the joint, although I have tried great numbers, even to the last battle of Toulouse. I know that persons, wounded in this way, have lived; for, a recovery it cannot be called, where the limb is useless, bent backward, and a constant source of irritation and distress, after several months of acute suffering, to obtain even this partial security from impending death; but, if one case of recovery should take place in fifty, is it any sort of equivalent for the sacrifice of the other forty-nine? Or is the preserving of a limb of this kind an equivalent for the loss of one man?" (*On Gun-shot Wounds, p.* 196.)

In the attack of the village of Merksam near Antwerp early in 1814, a soldier of the 95th regiment was brought to our field hospital, having received a musket ball through the knee-joint. The staff surgeons on duty, and Mr. Curtis, surgeon of the 1st guards, were preparing to amputate the limb, when a surgeon, attached to the 95th, urgently recommended deferring the operation. Superficial dressings were applied, and the patient sent to the rear. He lived several months after the accident, at times affording hopes of a perfect recovery; but, in the end, he fell a victim to hectic symptoms.

Mr. Guthrie allows, that fractures of the patella, without injury of the other bones, admit of delay, provided the bone is not much splintered.

*Seventh case.* According to M. Larrey, if a large biscayen, a small cannot-shot, or a piece of a bomb-shell, in passing through the substance of a member, should have extensively denuded the bone, without breaking it, amputation is equally indicated, although the soft parts may not appear to have particularly suffered. Indeed, the violent concussion produced by the accident, has shaken and disorganized all the parts; the medullary substance is injured, the vessels are lacerated, the nerves immoderately stretched, and thrown into a state of stupor; the muscles are deprived of their tone; and the circulation and sensibility in the limb are obstructed. Before deciding, however, M. Larrey cautions us to observe attentively the symptoms, which characterize this kind of disorder. This case can be supposed to happen only in the leg, where the bone is very superficial, and merely covered at its anterior part with the skin.

The following are described as the symptoms: the limb is insensible, the foot cold as ice, the bone partly exposed, and on careful examination, it will be found that the integuments, and even the periosteum, are extensively detached from it. The commotion extends to a considerable distance; the functions of the body are disordered; and all the secretions experience a more or less palpable disturbance. The intellectual faculties are suspended, and the circulation is retarded. The pulse is small and concentrated; the countenance pale; and the eyes have a dull moist appearance. The patient feels such anxiety, that he cannot long remain in one posture, and requests, that his leg may be quickly taken off, as it incommodes him severely, and he experiences very acute pain in the knee. When all these characteristic symptoms are conjoined, says M. Larrey, we should not hesitate to amputate immediately; for, the leg would be attacked with sphacelus the same day, and the patient certainly perish.

M. Larrey next adduces several interesting cases in support of the preceding observations.

*Eighth case.* When a large gynglimoid articulation, such as the elbow, or especially the knee, has been extensively opened with a cutting instrument, and blood is extravasated in the joint, M. Larrey deems immediate amputation necessary. In these cases, the synovial membranes, the ligaments and aponeuroses, inflame, the part swells, and erethismus rapidly takes place; and acute pains, abscesses, deep sinuses, caries, febrile symptoms, and death, are the speedy consequences. M. Larrey has seen numerous subjects die of such injuries, on account of the operation having been postponed with a hope of saving the limb. In his Mémoires de Chirurgie Militaire, Tom. 2, some of these are detailed.

Although a wound may penetrate a joint, yet, if it be small and unattended with extravasation of blood, M. Larrey informs us, it will generally heal, provided too much compression be not employed. This gentleman believes in the common doctrine of the pernicious effect of the air on the cavities of the body; yet, in this place, a doubt seems to affect him: speaking of the less danger of small wounds of joints, he says; "*a quoi tient cette différence, puisque l'air pénètre dans l'articulation dans l'un comme dans l'autre cas?*"

When two limbs have been at the same time so injured, as to require amputation, we should not be afraid of amputating them both immediately, without any interval. We have, says M. Larrey, several times performed this double amputation, with almost as much success, as the amputation of a single member. He has recorded an excellent case in confirmation of this statement. (*Mém. de Chirurgie Militaire, Tom. 2, p.* 478.)

When a limb is differently injured at the same time in two places, and one of the wounds requires amputation, (suppose a wound of the leg with a splintered fracture of the bone, and a second of the thigh, done with a ball, but without any fracture of the os femoris, or other bad accident) M. Larrey recommends us, first to dress the simple wound of the thigh, and amputate the leg immediately afterwards, if the knee be free from injury. When it is necessary to amputate above this joint, the less important wound need not be dressed, till after the operation, provided it can be comprehended in the section of the member, or be so near the place of the incision as to alter the indication. When the wound, demanding amputation, is the upper one, the operation of course is to be done above it, without paying any regard to the injury situated lower down.

M. Larrey, however, approves of deferring the operation, when delirium, convulsions, and inflammation prevail on the first receipt of the injury. In this circumstance, we are advised to take measures for appeasing these accidents; the progress of nature is to be carefully observed; and the first moment of quiet is to be taken advantage of, for the performance of the operation. (See *Larrey's Mém. de Chirurgie Militaire, Tom.* 2. *p.* 451, *&c.*)

*Ninth case.* To the foregoing species of gun-shot wounds, pointed out by M. Larrey as urgently requiring immediate amputation, my own experience, and the observations of Dr. Thomson, justify me in adding compound fractures of the thigh from gun-shot violence. I am particularly glad, that the latter gentleman has devoted a proper degree of attention to these cases; for, the opportunities, which I had of judging when abroad, incline me to believe, that military surgeons are not yet sufficiently impressed with the propriety of immediate amputation in gun-shot fractures of the thigh. There were brought into my hospital at Oudenbosch in 1814, about eight of such cases, all in the worst state for an operation, because several days had elapsed after the receipt of the injuries. All these patients died, excepting one, whose fracture was not far above the condyles, and I do not know, that he ever regained a very useful limb. Another had indeed been rescued by amputation from the dangers of the injury; but, was unfortunately lost by secondary hemorrhage about three days after the operation. The bleeding was almost instantly suppressed; yet, such was the weakness of the patient, that the irritation of securing the vessel, and the loss of blood together, destroyed at once every hope of recovery. Were I to judge, then, from my own personal observations in the army, and from some other cases, which I saw under my colleagues, I should without hesitation recommend immediate amputation in all cases of compound fractures of the thigh, caused by grape-shot, musket balls, &c. If there are any exceptions to this advice, they are such as are specified in the article *Amputation.*

"Gun-shot fractures of the thigh (says Dr. J. Thomson) have been universally allowed to be attended with a high degree of danger; indeed, till of late years, very few instances have been recorded of recovery from these injuries. Ravaton acknowledges, that, in his long and extensive experience, he had never seen an example of recovery from a gun-shot fracture of the thigh; and Bilguer, in his calculations, with regard to those, who recover from gun-shot fractures, sets aside those of the thigh-bone, as being of a nature altogether hopeless. In the present improved state of military surgery, instances not unfrequently occur of recovery, from this fracture; but, of these, the number will be found, I believe, to be exceedingly small, in comparison with those who die, particularly when the fracture has had its seat above the middle of the bone, &c."

According to the observation of Percy, scarcely two of ten recover of those, who have suffered gun-shot fractures of the thigh-bone. Mr. Guthrie, who seems to have paid greater attention to this subject, than any preceding author, says, that "upon a review of the many cases, which I have seen, I do not believe, that more than one sixth recovered, so as to have useful limbs; two thirds of the whole died either with or without amputation; and the limbs of the remaining sixth, were not only nearly useless, but a cause of much uneasiness to them for the remainder of their lives." (See *Guthrie on Gun-shot Wounds, p.* 191.)

"In fractures by musket bullets of the lower part of the thigh-bone (says Dr. Thomson) recovery not unfrequently takes place; and both Schmucker and Mr. Guthrie conceive, that they are injuries, in which amputation may be delayed with safety. It would be very agreeable, that this opinion should be confirmed by future experience; but, it appears to me, that before it can be received as a maxim in military surgery, much more extensive and accurate observation, than we yet possess, will be required, with regard to the proportion of those, who recover without amputation, or after secondary operations, and of those who recover after primary amputation. Of those, who had suffered this injury, we saw, comparatively, but a small number recovering in Belgium, and they had been attended with severe local and constitutional symptoms." See *Report of Observations made in the Military Hospitals in Belgium, p.* 247, *et seq.*

In the article *Amputation*, I have described the manner, in which balls produce fissures of several inches in length in the thigh-bone. This is a state of bone, observes Dr. Thomson, which must be very unfavourable to recovery, and his conclusion is, that, in general, even in fractures of the lower part of the thigh-bone, a greater number of lives will be preserved, in military practice, by immediate amputation, than by attempting the cure, without that operation. "When the bone appears, on a careful examination, to be broken without being much splintered, and when the patient can be removed easily to a place of rest and safety, it may be right to attempt to preserve the limb; but, if the bone be much splintered, or if the conveyance is to be long, or uncertain, it will, in most instances, I am convinced, be a much safer practice, even in fractures of this part of the thigh-bone, to amputate without delay.

"Musket-bullets, in passing through the femur, near to the knee-joint, produce fissures of the condyles, which generally communicate with the joint. These cases, like those, in which the bullets have passed directly through the joint, require immediate amputation."

"The writings of military surgeons contain but few histories of cases, in which the thigh bone had been fractured above its middle by the passage of musket-bullets. These are cases, I believe, which have generally had a fatal termination; and the danger, attendant upon the amputation, which they require, seems long to have deterred surgeons from attempting to ascertain what advantages might be derived from the employment of that operation. Schmucker recommends, and states, that he had practised with success immediate amputation in those cases, in which a sufficient space was left below the groin for the application of the tourniquet. It is curious to remark, in the history of amputation, how long surgeons were in discovering the ease and safety, with which the femoral artery may be compressed by the fingers, or pads, in its passage over the brim of the pelvis. Boy, from the immediate danger, protracted suffering, and ultimate want of success, which he had observed to follow this kind of injury, urges strenuously the propriety of immediate amputation: Mr. Guthrie's opinion, with regard to the dangerous nature of these injuries, and the advantages to be derived in them from immediate amputation, coincides in every respect with those of Schmucker and Boy. He observes, that those, whose thigh-bone has been fractured in its upper part by a musket-bullet, generally die with great suffering, before the end of the sixth, or eighth week; and that few even of those escape, in whom that bone has been fractured in its middle part. Of the few, whom we saw, who had survived gun-shot fractures in the upper part of the thigh-bone in Belgium, scarcely any one could be said to be in a favourable condition. In all the limbs were much contracted, distorted, and swollen, and abscesses had formed round and in the neighbourhood of the fractured extremities of the bones. In some instances, these abscesses had extended down the thigh; but, more frequently, they passed upwards, and occupied the region of the hip-joint and buttocks. In several instances, in which incisions had been made for the evacuation of matter, the fractured and exfoliating extremities of the bones sometimes comminuted, and sometimes forming the whole cylinder, could be felt bare, rough, and extensively separated from the soft parts, which surrounded them. In other instances, these extremities were partially inclosed in depositions of new bone, which, from the quantity thrown out, seemed to be present in a morbid degree. It was obvious, that, in all of these cases, several months would be required for the reunion of the fractured extremities; that, in some, much pain and misery were still to be endured from the processes of suppuration, ulceration, exfoliation, and ejection of dead bone; that in some cases, the patients were incurring great danger from hectic fever, and from diarrhœa; that the ultimate recovery in most of them was doubtful, and that of those, in whom this might take place, there was but little probability, that any would be able to use their limbs! The sight of these cases (says Dr. Thomson) made a deep impression upon my mind, and has tended to increase my conviction, that this is, of all others, the class of injuries, in which immediate amputation is most indispensably required." (See *Report of Observations made in the Military Hospitals in Belgium, p.* 254—258.)

Dr. Thomson adds, that what has been said of the danger of fractures, produced by musket-bullets, in the upper part of the femur, is true in a still greater degree of those, which have their seat in the neck, or head of that bone. In such instances, Dr. Thomson joins the generality of modern army surgeons in strongly recommending amputation at the hip-joint; a subject, of which I have already spoken. (See *Amputation.*)

### OF GUN-SHOT WOUNDS, IN WHICH AMPUTATION MAY BE DEFERRED.

If, says M. Larrey, it be possible to specify the cases, in which amputation ought to be immediately performed, it is impossible to determine *à priori* those, which will require the operation subsequently. One gun-shot wound, for example, will be cured by ordinary treatment, while, another, that is at first less severe, will afterwards render amputation indispensable, whether this be owing to the patient's bad constitution, or the febrile complaints, which are induced. However this may be, the safe rule for fulfilling the indication, that presents itself, is to amputate consecutively only in circumstances, in which, every endeavour to save the limb is manifestly in vain. Upon this point M. Larrey's doctrine differs from that of Faure.

The latter practitioner admits cases, which he terms cases *of the second kind*, in which he delays amputation, not with any hope of saving the limb, but, in order to let the first symptoms subside. The operation, done between the fifteenth and twentieth day, appears to him less dangerous, than when performed immediately after the receipt of the injury. At the above period, according to M. Faure, the commotion, occasioned by the gun-shot injury, is dispelled; the patient can reconcile himself to amputation, the mere mention of which fills the pusillanimous with terror in a greater or lesser degree; the debility of the individual is no objection; and it is laid down as an axiom "that the consequences of every amputation, done in the first instance, are in general extremely dangerous." In support of this theory, M. Faure adduces ten cases of gun-shot injuries, in which after the battle of Fontenoy, the operation was delayed, in order that it might afterwards be performed with more success: a plan, which, acording to the author, proved completely successful. (See *Prix de l'Acad. de Chirurgie, Tom.* 8, *Edit. in* 12*mo.*)

This division of the cases for amputation into two classes, not consistent with nature, observes M. Larrey, has been the cause of a great deal of harm. Very often the partisans of M. Faure have not dared to resort in the first instance to amputation, the dangers of which they exaggerate; while, on other occasions, they amputate, consecutively, without any success.

The effects of commotion, instead of increasing, says M. Larrey, gradually diminish and disappear after the operation. The proximate cause of all the ill effects of such commotion, is ascribed by this experienced author to the violent percussion of the foreign body, which percussion is propagated extensively to every part that is susceptible of it. According to the same writer, it is also owing to the laceration, or incomplete section of the injured nerves, and the inflammatory turgescence of the vessels. The speedy amputation of the limb must then produce a favourable change in the whole animal economy. In fact, the tense nerves, on being divided, says he, are set at liberty, and the fluids circulate with greater facility; the irritation, which always accompanies terrible injuries, is appeased; and the loaded vessels get rid of their redundant blood, and contract. Constriction, inflammation, and erethismus, which always complicate great lacerated wounds, according to M. Larrey, are thus prevented. It is then proved, says he, that the commotion, so far from being a counter-indication to immediate amputation, is a reason that should incline the surgeon to operate. Such was the sentiment of La Martinière and Boucher.

M. Larrey next cites some cases in support of the foregoing observations; but, these I shall here omit, in order, that the present article may not be immoderately enlarged.

Neither ought the patient's alarm to be a reason for postponing the operation; for, according to M. Larrey, the patient, just after the accident, will be much less afraid of the risk, which he has to encounter, than after the expiration of the first four and twenty hours, when he has had time to reflect upon the consequences of the injury, or of amputation. This remark has been made by the illustrious Paré.

" Experience, agreeing with my theory, (says M. Larrey) has proved both to the army and navy surgeons, that the bad symptoms which soon follow such gun-shot injuries, as must occasion the loss of a limb, are much more to be dreaded, than those of immediate amputation. Out of a vast number of the wounded, who suffered amputation in the course of the first four and twenty hours after the memorable naval battle of the first of June, 1794, a very few lost their lives. This fact has been attested by several of our colleagues, and, especially, by M. Fercoc, surgeon of the ship *le Jemmappe*."

The following is said to be an extract from one of his letters.

" After the naval engagement on the first of June, 1794, a great number of amputations were done immediately after the receipt of the injuries. Sixty of the patients, whose limbs had been thus cut off, were taken to the naval hospital, at Brest, and put under the care of M. Duret. With the exception of two, who died of tetanus, all the rest were cured; and there was one, who had had both his arms amputated. The surgeon of the *Téméraire*, which ship was captured by the English, was desirous in compliance with the advice of their medical men, to defer the operation, which many of the wounded stood in need of, till his arrival in port; but, he had the mortification to see them all die during the passage, &c."

M, Larrey next acquaints us, that, when he was sent to the army of Italy, in 1796, he had also the pain of seeing, in the hospitals, great numbers of the wounded fall victims to the confidence, which many of the surgeons of that army placed in the principles of M. Faure. General Bonaparte saw, that the *ambulance volante* was the only thing, that, in the event of fresh hostilities, could prevent such accidents; and, in consequence of his orders, M. Larrey formed the three divisions d'ambulance which are described in his Mémoires de Chirurgie Militaire.

Since this period it has always been customary in the French armies, on the day of battle, to make every preparation for performing amputations as speedily as possible. The mere sight of these *ambulances,* (always attached to the advanced guard,) says M. Larrey, encourages the soldiers, and inspires them with the greatest courage. On this occasion, the following anecdote is cited from Ambrose Paré.

This famous surgeon having been urgently sent for by the duke de Guise besieged in Metz, to attend the wounded of his army, who were in want of assistance, Ambroise Paré was shewn to the frightened soldiers, at the breach. Upon this, they immediately filled the air with shouts of the most lively joy, and cried out: " *Nous ne pouvons plus mourir, s'il arrive que nous soyons blessés, puisque Paré est parmi nous.*" Their courage revived, and their confidence in this skilful surgeon, contributed to the preservation of a place, before which a formidable army was destroyed.

M. Larrey desires us to interrogate the invalids, who have lost one, or two of their limbs, and nearly all will tell us, that they suffered amputation a few minutes after the accident, or in the first four and twenty hours.

" If Faure now retains any partisans," says M. Larrey, " I recommend them to repair to the field of battle, the day after an action; they would then soon be convinced, that, without the prompt performance of amputation, great numbers of soldiers must inevitably lose their lives. In Egypt, this truth was particularly manifested."

The following communication upon this point was made to M. Larrey by M. Masclet, a French surgeon on duty at Alexandria.

" In the naval hospital of this port, I have seen eleven soldiers, or sailors, who were wounded in the naval action off Aboukir, and who had suffered amputation in the first four and twenty hours.

In five of these cases, the operation had been done on the arm; in two, on the thigh; and, in three others, on the leg. All these men are recovering. In the army hospital, there have been only three thigh-amputations, which were performed seven or eight days after the battle, and these three patients died a few days after the operation, although the operation was done methodically, and no grave symptoms prevailed at the time of its performance. You see, sir, experience has, in this instance, quite confirmed your principles."

In 1780, during the American war, we are informed by M. Larrey, that the surgeons of the French army performed a great number of amputations, according to the opinion then generally adopted in France, that the operation should not be undertaken till after the subsidence of the first symptoms. Almost all the patients, thus treated, died after the operation. On the contrary, the Americans, who had the boldness to amputate immediately (or in the first twenty-four hours) upon many of their wounded countrymen, lost only a very few. Yet, M. Dubor, at that time surgeon to the Artois dragoons, and from whom M. Larrey has collected this fact, relates, that the situation of the hospital for the French wounded was, on many accounts, the most advantageous. (See *Dubor's These Inaugurale, soutenne* 16 *Septembre*, 1803, *à l'Ecole de Strasbourgh.*)

Admitting, says M. Larrey, that, by a concurrence of fortunate circumstances, which are not always to be calculated upon, some patients escape the danger of the first symptoms, this proves nothing in favour of doing the operation afterwards: it must be seen what nature will do towards the event of the case.

If, at the end of twenty, or thirty days, the prognostic is as bad as it was previously, amputation cannot be avoided. Thus all the sufferings, which the patient has endured, have been undergone for nothing, and the operation will now be attended with considerable risk, inasmuch as the patient may lie in a dangerously weakened state.

If nature revives at all, no doubt, the success of the operation becomes more probable; but, in this case, the surgeon, instead of having recourse to amputation, should redouble his efforts to preserve the limb.

### CASES DEMANDING AMPUTATION CONSECUTIVELY.

M. Larrey gives us the annexed information upon this subject.

*First Case. A spreading Mortification.* If the disorder be owing to an internal and general cause, it would then be rashness in the surgeon to amputate before nature had put limits to the disease. This kind of gangrene, according to M. Larrey, is distinguished from that, which is named *traumatic*, by the symptoms, which precede and accompany it. These symptoms are similar to those, which are observed in nervous ataxia, or adynamia. Here the operation ought to be deferred, and endeavours made to combat the general causes with regimen and internal medicines.

But, when the gangrene is *traumatic*, the limb, says M. Larrey, should be immediately cut off above the disorganised part. Several facts, in support of this advice, are related by this experienced surgeon in his *Mémoire sur la Gangrene Traumatique.* (See *Mortification.*)

In that part of the dictionary will be found several additional observations, in favor of the practice adopted and recommended by M. Larrey.

How contrary this advice to that inculcated by Sharp, Pott, and nearly all eminent surgeons of the present time!

In the article *Amputation, P.* 24, I have noticed a particular case of gangrene, which has been pointed out by Mr. Guthrie, as demanding the early performance of amputation, and a deviation from the old rule of waiting till the mortification has ceased to spread. (See *Guthrie on Gun-shot Wounds of the Extremities, p.* 63, *&c.*)

*Second Case. Convulsions of the wounded Limb.* Amputation of the member, performed immediately the first symptoms of tetanus manifest themselves, interrupts all communication between the source of the disorder, and the rest of the body. The operation, according to M. Larrey, unloads the vessels, and thus puts a stop to the tension of the nerves, and to the convulsions of the muscles. These first effects, he says, are followed by a general collapsus, which promotes the excretions, sleep, and the equilibrium of every part of the system.

The whole of the momentary pain, caused by the operation, cannot increase the existing irritation: besides the sufferings of tetanus render those of amputation more bearable, and lessen their intensity, especially, when the principal nerves of the limb are strongly compressed.

*Third Case. Bad State of the Discharge.* It often happens, that in gun-shot wounds, complicated with fractures, notwithstanding the most skilful treatment, the discharge becomes of a bad quality; the fragments of bone lie surrounded with the matter, and have not the least tendency to unite; the patient is attacked with hectic fever, and a colliquative diarrhœa. Under these circumstances, life may sometimes be preserved by amputation.

*Fourth Case. Bad State of the Stump.* In hospitals, says M. Larrey, the cure of amputations is sometimes prevented by a fever of a bad character. The stump swells, the integuments become at first retracted, and then reverted and diseased a good way upward. The wound changes into a fungous ulcer, the cicatrization of which is hindered by the deep disorder of the bone, and the ulceration of the soft parts. The extremity of the bone projects. In order to remedy this last evil, it has been proposed to saw off the projecting part of the bone, and, with this, even to amputate all the flesh beyond the level of the skin. M. Larrey condemns such practice, as unnecessary and dangerous, and he recommends giving nature time to effect the exfoliation of the diseased projecting part of the bone, and heal the wound. The foregoing observations, relative to amputation in cases of gun-shot wounds, are taken from the latter part of the second volume of Larrey's Mémoires de Chirurgie Militaire.

### GUN-SHOT WOUNDS OF THE ABDOMEN.

These cases may be divided into two kinds; one only penetrates the parietes of the belly, without hurting the contained parts; the other does mischief also to the viscera. The event of these two kinds of wounds is very different. In the first, little danger is to be expected, if properly treated; but, in the second, the success will be extremely uncertain, for, in many instances, nothing can be done for the patient, and, on other occasions, a good deal of art may be employed with advantage.

It is observed by Mr. Hunter, that such wounds of the abdomen, as do not injure parts like the stomach, intestines, bladder, ureters, gall-bladder, large bloodvessels, &c. all which contain particular fluids, will generally end well. But, he adds, that there will be a great difference, when the ball has passed with immense velocity, as a slough will be produced; whereas, when the ball has moved with less impetus, there will not be so much sloughing, and the parts will, in some degree, heal by the first intention. Even when the ball occasions a slough, the wound frequently terminates well, the adhesive inflammation taking place on the peritoneum, all round the wound, so as to exclude the general cavity of the abdomen from taking part in the inflammation. Such is often the favourable event, when the ball, besides entering the abdomen, has wounded parts like the omentum, mesentery, &c. and gone quite through the body. (*Hunter on Inflammation; Gun-shot Wounds, &c. p. 543.*)

In gun-shot wounds of the belly, an extravasation is apt to take place on the sloughs becoming loose, about eight, ten, twelve, or fourteen days, after the accident; but, says Mr. Hunter, although this new symptom is in general very disagreeable, most of the danger is usually over, before it can appear.

In the article, *Wounds*, we have detailed at large the general principles, which should be observed in the treatment of wounds of the belly, and, in order to avoid superfluous repetitions, suffice it in the present place to refer to that part of the dictionary.

For the purpose of illustrating the mode of treating gun-shot wounds of the abdomen, complicated with injury of the intestines and bladder, I shall lay before the reader the annexed observations from M. Larrey.

At the assault of Cairo, 1799, M. N. was shot in the abdomen with a ball, which divided the muscular parietes of this cavity on the right side, and a portion of the ilium. M. Larrey being upon the field of battle, gave him the first assistance. The two ends of the intestine were protruded, separated from each other, and inflated. The upper end was everted, in such a way, that its contracted edge, like the prepuce in a case of paraphymosis, strangulated the intestinal tube. The course of the fecal matter was thus obstructed, and the contents of the bowel accumulated above the constriction.

Although the patient's recovery was nearly hopeless, both from the nature of the wound, and from the debility and cholera morbus, which had already seized him in the short period, that he remained without succour in one of the intrenchments, M. Larrey was desirous of trying what could be done for so singular a case.

This eminent military surgeon first made four small cuts, through the constricted part of the intestine, with a pair of curved scissars, and put the bowel into its ordinary state. He passed a ligature through the piece of the mesentery, corresponding to the two extremities of the bowel.—These he reduced as far as the margin of the opening, which he had taken care to dilate, and the dressings having been applied, he awaited events. The first days were attended with alarming symptoms, which, however, afterwards subsided. Those, which depended upon the loss of the alimentary matter, successively abated; and, after two months, the ends of the ilium were opposite each other, and disposed to become connected together. M. Larrey seconded the efforts of nature, and dressed the patient with a tampon, or sort of tent, that was occasionally employed for two months. The patient was then discharged from the hospital quite cured.

In several instances, says M. Larrey, the sigmoid flexure of the colon was injured, and yet the wounds were cured without any fecal fistulæ. At the siege of Acre, three examples occurred; and, at that of Cairo, two. M. Larrey took care to dilate well the entrance and exit of the ball. Clysters, made of the decoction of linseed, and emollient beverages were frequently exhibited; and the patients were kept on low diet, and in the most quiet state.

M. Larrey informs us, that the gun-shot wounds of the bladder, which occurred in Egypt, had for the most part a favourable termination. The most remarkable case was that of Francis Chaumette, a light horseman, who was wounded at the battle of Tabor. The ball passed across the hypogastrium, about one finger-breadth above the pubes, to the point of the left buttock, which corresponds to the ischiatic notch. The direction of the wound, and the issue of feces and urine from the two orifices, could not let M. Larrey doubt, that the bladder and rectum were injured. M. Milioz, who directed the surgical affairs of the division of the army under Kleber, diligently pursued the same kind of treatment which he had seen M. Larrey adopt at the siege of Acre. During the suppurative stage, the patient was affected with fever; and, after the sloughs were detached, the discharge was very copious. A catheter, that was passed into the bladder, prevented an extravasation of the urine, and, at the same time, promoted the union of the wound of that viscus. This was healed the first, and the patient upon his return to Cairo, was quite cured.

M. Larrey has recorded several other interesting cases of wounds of the bladder, to which I must content myself with referring. (See *Mémoires de Chirurgie Militaire, Tom.* 2, *p.* 160—165. *Tom.* 3, *p.* 340, *&c.*)

This experienced military surgeon offers the following as a succinct account of the results of such injuries, and the treatment, which is proper.

During the first four and twenty hours very little urine escapes from gun-shot wounds of the bladder, in consequence of the swelling, which almost instantly affects the lips of the wound. When the bladder is full, this fluid is only discharged at the moment of the accident, and only from the wound, by which the ball has made its exit. An extravasation is prevented by the thick slough, which fills all the track of the injury, and it is not till the deadened parts become loose, that any effusion can happen. Hence, it is of the highest importance to have an elastic gum catheter introduced into the urethra, where it should be kept, and the instrument should be large enough to fill exactly this canal; for, if at the period, when the sloughs are detached, the urine has not a ready passage outward, it passes through the wound, and is extravasated the more readily, inasmuch as the separation of the sloughs has occasioned many openings, by which the fluid may insinuate itself into the cellular membrane. Hence, gangrenous mischief and death.

After having well dilated the wounds, in order to facilitate the escape of the urine, which might lodge in the track of the ball, a large elastic gum catheter should be introduced, and left in the bladder, taking care to withdraw it, and pass in a clean one every two or three days, so that no incrustations may occur. Emollient clysters, and acidulated demulcent drinks are to be prescribed, and the patient is to be kept upon a very low regimen, and in the most quiet state. The dressings are to be simple, and cleanliness observed. (*Op. cit. T.* 2, *p.* 165—160.)

After the battle of Waterloo, I was not a little surprised to find in the St. Elizabeth hospital at Brussels, a considerable number of cases, in which either the intestines, the stomach, the omentum, or the bladder, were protruded. I think we had in the division under staff surgeon Collier and myself not less than three protrusions of the bladder. An order, which I received to join the army in the field on the 27th of June, deprived me of the opportunity of witnessing the progress and termination of these interesting cases. However, many had ended fatally before my departure from Brussels.

### GUN-SHOT WOUNDS OF THE THORAX.

Wounds of the lungs, abstracted from other mischief, are now well known not to be always fatal. Mr. Hunter had some reason to believe, that wounds of the lungs, made with balls, were generally less dangerous, than such as were made with sharp-pointed instruments; for, he had seen several patients recover, after they had been shot through the lungs, while other persons died of very small wounds of those organs, done with swords and bayonets. Perhaps one cause of this fact may be owing to the circumstance of gun-shot wounds bleeding less than other wounds, so that there is not so much danger of blood being effused in the cavity of the chest, or the cells of the lungs. The indisposition of the orifice of a gun-shot wound to heal up too soon, is also another circumstance, that must lessen the hazard; as whatever matter happens to be extravasated has thereby an opportunity of escaping.

But, from what has been stated, it must not be inferred, that gun-shot wounds of the lungs are not accompanied with a serious degree of danger. Frequently, the patient expires instantly, being suffocated in consequence of the hemorrhage from those organs; for, though it be true, that gun-shot wounds generally do not bleed much, when the injured vessels are under a certain size, yet, the contrary is the case, when the wounded vessels are like those, which exist towards the root of the lungs. Gun-shot wounds of the chest also often prove fatal by the inflammation, that is excited within this cavity.

It cannot be supposed, that adhesions take place round the opening of a gun-shot wound in the chest, because the lungs collapse, and become considerably distant from the pleura, whenever a free communication is established between the atmospheric air and the cavity of the thorax. However, as adhesions are extremely common between the outer surface of the lungs, and the inner surface of the pleura costalis, they must, in many instances, exist before the receipt of a wound, and, of course prevent the usual collapse of the lungs.

The general symptoms, and also the treatment of wounds of the chest, are detailed in the article, *Wounds*, Suffice it in the present place to observe, that, when a patient has been shot in the chest, the most important indication is to prevent and subdue inflammation of the lungs and pleura. In few other cases, can repeated and large bleedings be so advantageously practised. The patient is also to be kept on the lowest diet, take febrifuge medicines, and, if he be much disturbed with a cough, the supermaceti mixture with opium. Here, there will not be so much danger of an extravasation of blood, as in stabs, and, even if an effusion of that fluid were to happen within the cavity of the pleura, the opening would generally be sufficient for its escape, and it would not be so frequently found necessary to dilate the wound, or make a new opening, as when the injury has been inflicted with a sharp-pointed weapon.

When matter forms in the thorax in consequence of gun-shot wounds, the opening will generally suffice for its escape; but, should the collection of pus be confined and occasion dangerous symptoms, the external wound must either be enlarged, or a new incision be practised, according as circumstances may indicate. The mode of making an opening into the chest is considered in the article, *Paracentesis.*

For information on gun-shot wounds, consult the *works of Ambrose Paré; Ranby on the Cure of Gun-shot Wounds, 8vo. London,* 1744. *Observations sur des Plaies d'armes à feu, compliquées de fracture, aux articulations des extremités, ou au voisinage de ces articulations, par M. Boucher: in Mém. de l'Acad. de Chirurgie, Tom.* 5, *p.* 279. *Edit. in* 12*mo. Observations sur des Plaies d'armes à feu compliquées sur tout de fracas des os, par M. Boucher, in opere cit. Tom.* 6, *p.* 109, *&c. Edit. in* 12*mo. Observations sur les Plaies d'armes à feu;* 1. *Sur un coup de fusil, avec fracas des deux machoires; par M. Cannac.* 2. *Sur une Plaie d'arme à feu traversant la Poitrine d'un côté à l'autre; par M. Gerard.* 3. *Sur une Plaie d'arme à feu, pénétrante depuis la partie anterieure du pubis, jusqu' à l'os sacrum; par M. Andouillé.* 4. *Sur une Jambe écrasée par un Obus, ou petite bombe, par M. Cannac.* 5. *Sur une Plaie à la partie inférieure et interne de la Jambe faite par un éclat de Grenade, sans fracas d'os; par M. Cannac.* 6. *Précis de plusieurs Observations sur les Plaies d'armes à feu en différentes parties par M. Bordenave. All these papers are inserted in Mém. de l'Acad. de Chirurgie, Tom.* 6, *in* 12*mo., and in Tom.* 11 *of the same edition, are inserted Mémoire sur le traitement des Plaies d'armes à feu, par M. de la Martinire, & Mémoire sur quelques particularités concernant les Plaies faites par armes à feu, par M. Vacher. M. Faure's memoirs relative to amputation in cases of gun-shot wounds may be seen in Tom.* 8, *of the Recueil des Pieces qui ont concouru pour le Prix de l'Acad. de Chirurgie, Edit. in* 12*mo. John Hunter's Treatise on the Blood, Inflammation, and Gun-shot Wounds. Richter's Anfangsgrunde der Wundarzneykunst, Band* 1. *Schmucker's Chirurgische Wahrnehmungen. Discourses on the Nature and Cure of Wounds by John Bell; p.* 169, *&c. Edit.* 3. *Richerand's Nosographie Chirurgicale, Tom.* 1, *Edit.* 4. *Chevalier's Treatise on Gun-shot Wounds, Edit.* 3. *Leveillé's Nouvelle Doctrine Chirurgicale, Tom.* 1, *Chap.* 8, *p.* 436, *&c. Encyclopédie Méthodique, Partie Chirurgicale, art. Plaies d'armes à feu. Larrey's Mémoires de Chirurgie Militaire. Memoire par M. Le Conte Prix de l'Acad. T.* 8. *Examen de plusieurs Parties de la Chirurgie par M. Bagieu, à Paris,* 1756. *Bilguer's Dissert. de Membrorum Amputatione rarissimé administrandâ, aut quasi abroganda; Halæ* 1761. *This work is celebrated as having attracted most deservedly the just and severe criticisms of Pott, La Martiniere, Morand, &c: Morand's Opuscules de Chirurgie,* 1768. *Van Gesscher, Abhandlung Von der Nothwendigkeit der Amputation; Freyburgh,* 1775. *The Chirurgical Works of Percival Pott, Lond.* 1779, *vol.* 1, *p.* 450—*vol.* 3, *p.* 490. *Kirkland's Observations on Pott's General Remarks on Fractures, Lond.* 1770. *Mursinna, Neue Medicinisch—Chirurgische Beobachtungen, Zweiter Theil. S.* 138. *Berlin,* 1796. *Wedekind's Nachrichten über das Fransische, Kriegspitalwesen, Erster Band. Leipzig,* 1797. *Baron Percy's Manuel du Chirurgien d'Armée, Paris,* 1792. *Graefe Normen für die Ablösung Grössener Gliedmassen, Berlin,* 1812. *Guthrie on Gun-shot Wounds of the Extremities, London,* 1815; *a work valuable, inasmuch as it is the only publication detailing the practice of our military surgeons during the late bloody and protracted war in Spain. Thomson's Report of Observations made in the military hospitals in Belgium, Edinburgh,* 1816. *A. C. Hutchison's Practical Observations in Surgery,* 1816.

**GUTTA SERENA.** A term, said to have been first applied by Actuarius to amaurosis, or the species of blindness arising from an insensible state of the retina, or optic nerve. (See *Amaurosis.*)

Under this latter head, I have treated of the subject so fully, that it is not my intention to expatiate upon it here. However, as there is one particular case, not noticed in the article, *amaurosis*, I must take the present opportunity of mentioning it.

According to the observations of Mr. Ware, persons, who labour under this disorder, are not unfrequently subject to a particular kind of ophthalmy, which occasions a most excruciating pain, and seems to require a peculiar mode of treatment. At the close of the remarks published on the ophthalmy, fistula lachrymalis, &c. by Mr. Ware, this gentleman has introduced a case of this kind, which was greatly relieved by making a puncture through the tunica sclerotica into the ball of the eye with a grooved needle, somewhat larger, than a common sized couching needle, nearly in the part, where this instrument is introduced in the operation of depressing the cataract. Through the groove of the instrument, a watery fluid immediately issued, which was not unlike that which Mr. Ware has several times seen effused between the choroid coat and retina after death, in cases of gutta serena. After the pain of the operation had ceased, the patient became quite easy, and the inflammation soon subsided. Since this example, Mr. Ware has performed a similar operation in a considerable number of resembling instances, and in several of them the proceeding has been attended almost immediately with manifest good effects.

For further information on this subject, the reader must refer to *Ware on the operation of largely puncturing the capsule of the crystalline humour, &c. and on the Gutta Serena, accompanied with pain and inflammation*, 1812.

# H.

**HÆMATOCELE,** (from αιμα, blood, and κηλη, a tumour.) This is a swelling of the scrotum, or spermatic cord, proceeding from, or caused by, blood.

A distinction of the different kinds of hæmatocele, though not usually made, is absolutely necessary toward rightly understanding the disease; the general idea, or conception of which, appears to Mr. Pott to be somewhat erroneous, and to have produced a prognostic which is ill-founded, and hasty. According to this eminent surgeon, "the disease, properly called hæmatocele, is of four kinds; two of which have their seat within the tunica vaginalis testis; one within the albuginea; and the fourth in the tunica communis, or common cellular membrane, investing the spermatic vessels.

"In passing an instrument, in order to let out the water from an hydrocele of the vaginal coat, a vessel is sometimes wounded, which is of such size, as to tinge the fluid pretty deeply at the time of its running out; the orifice becoming closed, when the water is all discharged, and a plaster being applied, the blood ceases to flow from thence, but insinuates itself partly into the cavity of the vaginal coat, and partly into the cells of the dartos; making, sometimes, in the space of a few hours, a tumour nearly equal in size to the original hydrocele. This is one species.

"It sometimes happens, in tapping an hydrocele, that although the fluid discharged by that operation be perfectly clear and limpid, yet, in a very short space of time, (sometimes in a few hours) the scrotum becomes as large as it was before, and palpably as full of a fluid. If a new puncture be now made, the discharge, instead of being limpid (as before) is now either pure blood, or very bloody. This is another species: but, like the preceding, confined to the tunica vaginalis.

"The whole vascular compages of the testicle is sometimes very much enlarged, and at the same time rendered so lax and loose, that the tumour produced thereby has, to the fingers of an examiner, very much the appearance of a swelling composed of a mere fluid, supposed to be somewhat thick or viscid. This is in some measure a deception; but not totally so: the greater part of the tumefaction is caused by the loosened texture of the testis; but there is very frequently a quantity of extravasated blood also.

"If this be supposed to be an hydrocele, and pierced, the discharge will be mere blood. This is a third kind of hæmatocele; and very different, in all its circumstances, from the two preceding: the fluid is shed from the vessels of the glandular part of the testicle, and contained within the tunica albuginea.

"The fourth consists in a rupture of, and an effusion of blood from, a branch of the spermatic vein, in its passage from the groin to the testicle. In which case, the extravasation is made into the tunica communis, or cellular membrane investing the spermatic vessels."

Each of these four, Mr. Pott says, he has seen so distinctly, and perfectly, that he has not the smallest doubt concerning their existence, and of their difference from each other.

"The tunica vaginalis testis, (he continues) in a natural and healthy state, is a membrane, which although firm, is of no great thickness; it is white, or rather of a reddish white colour; and its blood-vessels are (in a healthy state) no more apparent to the eye, than are those of the tunica albuginea: but when it has been long, or much distended, it thereby becomes thick, and tough; and the vessels (especially those of its inner surface) are sometimes so large, as to be very visible, and even varicous. If one of these lies in the way of the instrument, wherewith the palliative cure is performed, it is sometimes wounded; in which case, as I have already observed, the first part of the serum which is discharged, is pretty deeply tinged with blood.

"Upon the collapsion of the membranes, and of the empty bag, this kind of hemorrhage generally ceases, and nothing more comes of it. But it sometimes happens, either from the toughness of the tunic, or from the varicous state of the vessel, that the wound (especially if made by a lancet) does not immediately unite; but continues to discharge blood into the cavity of the said tunic, thereby producing a new tumour, and a fresh necessity of operation."

This is what Mr. Pott calls the first species of hæmatocele, which evidently consists in a wound of a vessel of the vaginal tunic.

"Upon the sudden discharge of the fluid, from the bag of an over-stretched hydrocele, and thereby removing all counter-pressure against the sides of the vessels, some of which are become varicous, one of them will, sometimes, without having been wounded, burst. If the quantity of blood, shed from the vessel so burst, be small, it is soon absorbed again; and, creating no trouble, the thing is not known *. But if the quantity be considerable, it, like the preceding, occasions a new tumour, and calls for a repetition of the operation." This, Mr. Pott calls the second species: "which, like the first, belongs entirely to the vaginal coat, and has no concern either with the testicle, or with the spermatic vessels. In both, the bag which was full of water, becomes in a short space of time distended with blood; which blood, if not carried off by absorption, must be discharged by opening the containing cyst: but in neither of these can castration (though said to be the only remedy) be ever necessary: the mere division of the sacculus, and the application of dry lint to its inside, will, in general, if not always, restrain the hemorrhage, and answer every purpose, for which so severe a remedy has been prescribed. The other two are indeed of more consequence; they interest either the testicle itself, or the vessels by which it is supplied with blood, and rendered capable of executing its office; and are sometimes not curable, but by removal of the part.

"One of these is seated within the tunica albuginea of the testicle; the other in the tunica communis of its vessels: they are neither of them very frequent; but when they do happen, they call for all our attention.

"If blood be extravasated within the tunica albuginea, or proper coat of the testicle, in consequence of a great relaxation, and (as it were) dissolution of part of the vascular compages of that gland, and the quantity be considerable, it will afford or produce a fluctuation, to the hand of an examiner, very like to that of an hydrocele of the tunica vaginalis; allowing something for the different density of the different fluids, and the greater depth of the former from the surface.

"If this be mistaken for a simple hydrocele, and an opening be made, the discharge will be blood; not fluid, or very thin; not like to blood circulating through its proper vessels; but dark, and dusky in colour, and nearly of the consistence of thin chocolate (like to what is most frequently found in the imperforate vagina.) The quantity discharged will be much smaller than was expected from the size of the tumour; which size will not be considerably diminished. When this small quantity of blood has been so drawn off, the testicle will, upon examination, be found to be much larger than it ought to be; as well as much more loose and flabby; instead of that roundness and resistance arising from an healthy state of the gland, within its firm strong coat; it is soft, and capable of being compressed almost flat, and that generally without any of that pain and uneasiness, which always attend the compression of a sound testicle. If the bleeding ceases upon the withdrawing the cannula (supposing a trochar to have been used) and the puncture closes, a fresh accumulation of the same kind of fluid is soon made, and the same degree of tumefaction is produced, as before the operation: if the orifice does not close, the hemorrhage continues, and very soon becomes alarming.

"In the two preceding species, the blood comes from the tunica vaginalis, the testis itself being safe, and unconcerned;

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* Hence, the last running of the water from an hydrocele, is often bloody.

and the remedy is found, by opening the cavity of the said tunic; but in this, the hemorrhage comes from the substance of the testicle; from the convolutions of the spermatic artery, within the tunica albuginea: the division of the vaginal coat can here do no good; and an incision made into the albuginea can only increase the mischief: the testicle is spoiled, or rendered useless, by that kind of alteration made in it, previous to the extravasation; and castration is the only cure, which a patient in such circumstances can depend upon.

"The last species of this disease arises from a bursting of a branch of the spermatic vein, between the groin and scrotum, in what is generally known by the name of the spermatic process. This, which is generally produced by great or sudden exertions of strength, feats of agility, &c. may happen to persons in the best health, whose blood and juices are in the best order, and whose genital parts are free from blemish, or disease.

"The effusion, or extravasation, is made into the cellular membrane, which invests and envelopes the spermatic vessels, and has something the appearance of a true hernia. When the case is clear, and the extravasated blood does not give way to discutient applications, the only remedy is to lay the tumour fairly open, through its whole length. If the vessel or breach be small, the hemorrhage may be restrained by mere compression with dry lint, or by the use of styptics; but if it be large, and these means do not succeed, the ligature must be made use of." (*Pott's Chirurgical Works, Vol. II.*)

The bleeding point should be tied singly. It can never be warrantable to tie the whole spermatic chord, and then perform castration, in a case like this, notwithstanding Mr. Pott advises this plan, in case the bleeding branch cannot be tied singly. Discutient applications, and an occasional purge, will almost always disperse the swelling; and if not, opening it, taking out the blood, filling the cavity with lint, and using compression, one may say, will always answer.

*The best of the old writers on Hæmatocele, are Celsus and Paulus Ægineta: Pott has excelled every modern one.*

**HARE-LIP.** (*Labia Leporina.*) A fissure, or longitudinal division of one or both lips.

Children are frequently born with this kind of malformation, particularly of the upper lip. Sometimes the portions of the lip, which ought to be united, have a considerable interspace between them; in other instances they are not much apart. The cleft is occasionally double, there being a little lobe, or small portion of the lip, situated between the two fissures. Every species of the deformity has the same appellation of *hare-lip*, in consequence of the imagined resemblance which the part has to the upper lip of a hare.

The fissure commonly affects only the lip itself. In many cases, however, it extends along the bones of the palate, even as far as the uvula. Sometimes these bones are totally wanting; sometimes, they are only divided by a fissure.

Such a malformation is always peculiarly afflicting. In its least degree, it constantly occasions considerable deformity; and when it is more marked, it frequently hinders infants from sucking, and makes it indispensable to nourish them by other means. When the lower lip alone is affected, which is not most frequently the case, the child can neither retain its saliva, nor learn to speak, except with the greatest impediment. But when the fissure pervades the palate, the patient not only articulates very imperfectly, but cannot masticate nor swallow, except with great difficulty, on account of the food readily getting up into the nose.

After these remarks, it is obviously very important to cure the malformation as soon as possible. But as this object cannot be accomplished without an operation, attended with some degree of pain, several practitioners, as Dionis, Garengeot, and others, have advised waiting till the child is four or five years old, on the supposition, that, at an earlier age, the child's agitations and cries would render the operation impracticable, or derange all the proceedings taken to ensure its success. It is plain, however, that such reasons are not exceedingly weighty. A child four or five years old, and, very often, even one eight or ten years of age, is more difficult to manage, in this circumstance, than an infant only a few months old. There is no child, though advanced to that age, which has not a thousand times more dread of the pain than of the deformity, or of the inconveniences of the complaint, to which he is habituated; while an infant of tender years fears nothing, and only feels the pain of the moment.

A more rational objection is the liability of infants to convulsions after operations, and this has induced many excellent surgeons of the present day to advise postponing the cure of the hare-lip, till the child is about two years old. Perhaps however, this apprehension does not vindicate the delay.

Mr. Sharp observes, "there are many lips, where the loss of substance is so great, that the edges of the fissure cannot be brought together, or, at best, where they can but just touch; in which case it need not be advised to forbear the attempt; it is likewise forbid in young children, and with reason, if they suck; but otherwise it may be undertaken with great safety, and even with more probability of success than in others that are older." (*Operations in Surgery, chap.* 34.)

Le Dran has performed the operation on children of all ages, even on those at the breast. B. Bell did it with success on an infant only three months old. Muys advises it to be undertaken as soon as the child is six months old. Roonhuysen operated on children ten weeks after their birth, and all his contemporaries have praised his singular dexterity and success. This latter surgeon advises, as a step essential to the success of the operation, to hinder children from sleeping a certain time before undertaking it, in order that they may fall asleep immediately afterwards. Opiates have also been recommended to ensure this occurrence. M. Louis is of opinion, that the operation done without any suture will succeed better on infants, than any other method. This subject, however, we shall treat of in due time.

All practitioners entertain the same sentiment with regard to the object of this operation, which consists in reducing the preternatural solution of continuity to the state of a simple wound, by cutting off the edges of the separated parts throughout their length, and then approximating these parts, so as to make them continue in contact until they have completely grown together. But although such principles are admitted by all surgeons, all are not of the same opinion with respect to the method, which it is best to follow in practice; some having recourse to sutures to keep the edges of the wound in contact; others disapproving of the plan, and believing that a perfect cure may always be accomplished by means of adhesive plaster and a uniting bandage, so as to save the patient a great deal of pain, which sutures always occasion.

M. Louis has been the chief advocate for this method, which proscribes sutures, and he has published on this subject two very interesting memoirs, which we shall presently quote, for the purpose of informing the reader of the reasons, on which this celebrated man founded his opinion on this matter, and of the means which he employed.

M. Louis thought that the use of sutures, in the operation for the hare-lip, originated from a false idea which prevailed, respecting the nature of the disease. The fissure in the lip having been wrongly imputed to the loss of substance, it was thought impossible to keep the parts in contact, except by a suture.

"The separation of the edges of the fissure in the lip is only the effect of the retraction of the muscles, and is always proportioned to the extent of the cleft. Those who have hare-lips are capable of bringing the edges of the fissure together by muscular action, when they pucker up their mouths. On the other hand, the separation is considerably increased when such persons laugh, and the breach appears excessively large, after superficially paring off its edges on both sides. Hence, the interspace in the hare-lip must not be mistaken for a loss of substance. The truth of this is confirmed by the effects of sticking plaster, which has sometimes been applied to the hare-lip, as a preparatory measure before the operation, and which exceedingly lessens the separation of the parts.

"According to the confession of all who have written in favour of the twisted suture, it seems advisable only on the false idea, that the hare-lip is the effect of a greater or lesser loss of substance; and they say, positively, that we must not have recourse to it when there is only a simple division to be united. The twisted suture must then be proscribed from the operation for the natural hare-lip, since it is proved that this malformation is unattended with a loss of substance. But the loss of substance is but too real, after the extirpation of scirrhous and cancerous tumours, to which the lips are very subject. Yet, even in these very cases, the extensibility of the lips allows an attempt to be made to reunite the double incision, by which the tumour has been removed, and it succeeds without the smallest deformity, when care has been taken to direct each incision obliquely, so that both of them form, where they meet, an acute angle, in the base of which the tumour is comprised. It is on this occasion, that the means to procure an union ought to be the more efficacious, because the difficulty of keeping the edges of the wound approximated is greater. M. Pibrac has already shewn, in his memoir on the abuse of sutures, when speaking of the hare-lip, that they are badly conceived means, and more hurtful in proportion to the greater loss of substance, because the greater the interspace is between the two parts, the more fear is there of their efforts on the needles or pins left in the wound. Hence, care has always been taken to make the dressings aid the operation of the suture. After this consideration, judiciously made by the partisans of this plan, there was only one more step to be taken, according to M. Pibrac, in order to evince the necessity of proscribing it. The cap, or copper headpiece, described by Verduc and Nuck, for compressing the cheeks; the clasps of Heister; the strips of adhesive plaster, which no author has neglected expressly to recommend; all this has been invented in order to support the parts, and keep them from being disunited. When the suture failed, it was by these means, that the original deformity was corrected, together with that produced by the laceration, which would not have occurred without the suture. As, then, the dressings, when methodically applied, are capable of effectually rectifying the mischief of the suture, why should they be considered only as a resource in a mere accidental case? Why should they not be made the chief and primary means of reuniting the lips, even when there is a loss of substance?

"Nothing can be opposed to the proofs adduced upon this point. They are even drawn from the practice of those, who have employed sutures without success. Such persons themselves have furnished the arguments in favour of the bandage being capable of repairing the mischief resulting from the twisted suture. Practitioners can only be vindicated in employing this suture by confessing, that the true principles of the art have not been established concerning this subject."

M. Louis, with a view of perfecting our notions on this matter, lays it down as a fact, that, the retraction of the muscles being the cause of the separation of the edges of the fissure, it is not to these edges we are to apply the force which is to unite them; but that it should be applied further to the very parts, whose action (the cause of the separation) is to be impeded, and whose contraction is thus to be prevented. A great many means for supporting the wound, only irritate the muscles and excite them to action, and it is this action which we should endeavour to overcome. The means for promoting a union can only be methodical, when directly employed to prevent such action, by an immediate application on the point where it is to be resisted. The facility, with which the parts may be brought forward, so as to bring the two commissures of the lips into contact, by the mere pressure of the hands, shews what may be expected from a very simple apparatus, which will execute the same office without any efforts, in a firm and permanent manner, and which will render sutures unnecessary, the inconveniences of which are too well known.

M. Louis, after having explained the reasons of the theory, on which he founded his method, relates several cases, taken either from his own practice, or that of others, to illustrate its advantages. He details the history of twenty cases, in which his plan perfectly succeeded, both in accidental hare-lips, with considerable loss of substance, and in natural ones. In most of these instances, however, it was thought proper to assist the bandage with one stitch at the extremity of the fissure, close to the vermilion border of the lip, for the purpose of keeping the parts securely on a level.

Notwithstanding the operation, as performed with the twisted suture, is opposed by an authority of such weight as that of M. Louis, still it is the method most commonly practised. Few practitioners doubt that a hare-lip may be cured by means of adhesive plaster, and uniting bandages, quite as perfectly as by a suture; and all readily allow, that the first of these methods, as being more simple and less painful, would be preferable to the latter one, if it were equally sure of succeeding. But it is considered far more uncertain in its effect. To accomplish a complete cure, the parts to be united must be maintained in perfect contact, until they have contracted the necessary adhesion; and how can we always depend upon a bandage keeping them from being displaced? What other means, besides a suture, affords in this respect such perfect security?

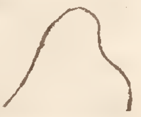
We shall not take upon us to decide which of these two methods is the best, contenting ourselves with explaining the mode of proceeding in both, and leaving it for surgeons to determine, by their own experience, and the evidence of facts, which one merits the preference. First, of the ancient plan.

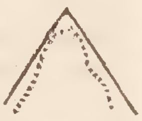
Having placed the patient in a convenient situation, the first thing is to examine whether there is any adhesion of the lip to the gum; and, if there be, to divide it with a knife. Some authors (*Sharp*) recommend always dividing the frænulum, which attaches the lip to the gum; but, when the hare-lip is at some distance from this part, which will not be in the way in the operation, there is no need for dividing it; but, when the frænulum is situated in the centre of the division, it is clear that, in operating, we must necessarily include it in the incision, and it must be divided before-hand, taking care not to encroach too much upon the gum, lest the alveolary process should be laid bare; nor too much upon the lip, because making it thinner would be unfavourable to its union.

Sometimes one of the incisor teeth being opposite the fissure, and projecting forward, must be drawn, lest it should distend and irritate the parts, after they have been brought into contact.

Sometimes also, but particularly in cases in which there is a cleft in the bony part of the palate, a portion of the os maxillare superius forms such a projection, just in the situation of the fissure in the lip, that it would render the union very difficult, if not impracticable. In this circumstance, the only plan is to cut off the projecting angles of bone, which may easily be done with a strong pair of bone-nippers.

In the operation, the grand object is to make the wound as smooth and even a cut as possible, in order that it may more certainly unite by the first intention, and of such a shape, that the cicatrix may form only one narrow line. The edges of the fissure should, therefore, never be cut off with scissars, which constantly bruise the fibres which they divide, and a sharp knife is always to be preferred. The best plan is, either to place any flat instrument, such as a spatula, underneath one portion of the lip, and then holding the part stretched and supported on it, to cut away the whole of the callous edge; or else to hold the part with a pair of forceps, the under blade of which is much broader than the upper one: the first serves to support the lip; the other contributes also to this effect, and, at the same time, serves as a sort of ruler in guiding the knife in an accurately straight line. When the forceps are preferred, the surgeon must of course leave on the side of the upper blade, just as much of the edge of the fissure as is to be removed, so that it can be cut off with one sweep of the knife. This is to be done on each side of the cleft, observing the rule, to make the new wound in straight lines, because the sides of it can never be made to correspond without this caution. For instance, if the hare-lip had this shape, the incision of the edges must be continued in straight lines, till they meet in the manner here represented. In short, the two incisions are to be perfectly straight, and are to meet at an angle above, in order that the whole track of the wound may be brought together, and united by the first intention.





Two silver pins, made with steel points, are next to be introduced through the edges of the wound, so as to keep them accurately in contact. A piece of thread is then to be repeatedly wound round the ends of the pins, from one side of the division to the other, first transversely, then obliquely, from the right or left end of one pin above, to the opposite end of the lower one, &c. Thus the thread is made to cross as many points of the wound as possible, which greatly contributes to maintaining its edges in even apposition. It is obvious, that a great deal of exactness is requisite in introducing the pins, in order that the edges of the incision may afterwards be precisely applied to each other. For this purpose, some previously place the sides of the wound in the best position, and mark with a pen the points at which the pins should enter, and come out again. The pins ought never to extend more deeply than about two-thirds through the substance of the lip, and it would be a great improvement always to have them constructed a little curved, as this is the course which they naturally ought to take when introduced. The steel points should also admit of being easily taken off, when the pins have been applied; and, perhaps, having them to screw off and on is the best mode, as removing them in this way is not so likely to be attended with any sudden jerk, which might be injurious to the wound, as if they were made to pull off. The pins may commonly be safely removed in about four days, after which the support of sticking plaster will be quite sufficient.

The process we have just been describing, is what is well known by the name of the *twisted suture.*

It is worthy of attention, that this suture is applicable to other surgical cases, in which the grand object is to heal some fistula or opening, by the first intention. Mr. Sharp says, it is of great service in fistulæ of the urethra, remaining after the operation for the stone, in which case the callous edges may be cut off, and the lips of the wound held together by the above method.

What has hitherto been stated, refers to the most simple form of the hare-lip, viz. to that which presents only one fissure. When there are two clefts, the cure is accomplished on the same principles; but, it is more difficult of execution; indeed, so much so, that the old surgeons, until the time of Heister, have almost all regarded the operation for the double hare-lip, as impracticable, though they have described it, directing us to operate on each fissure, just as if there were only one. M. de la Faye, however, performed this operation with success, as may be learnt in the *Mémoires de l'Acad. de Chirurgie, Tom.* 4. 4to. But, we are indebted to M. Louis for having obviated all the difficulties, by simply proposing to do the operation at two different times, and to await the perfect cure of one of the fissures, before undertaking that of the other. Heister seems to have conceived a similar idea, about the same time, but he never put it in practice, nor did he even positively advise it.

In cutting off the edges of the fissure, the incision must be carried to the upper part of the lip; and even when the fissure does not reach wholly up the lip, the same thing should be done; for, in this manner the sides of the wound will admit of being applied together more uniformly, and the cicatrix will have a better appearance. We should also not be too sparing of the edges which are to be cut off. Practitioners, says M. Louis, persuaded that the hare-lip was a division with loss of substance, have invariably advised the removal of the *callous* edges. But, in the natural hare-lip there is no callosity; the margins of the fissure are composed, like those of the lip itself, of a pulpy, fresh-coloured, vermilion flesh, covered with an exceedingly delicate cuticle. The whole of the part having this appearance, must be taken away, even encroaching a little way on the true skin. At the lower part of the fissure, towards the nearest commissure, a rounded red substance is commonly situated, which it is absolutely necessary to include in the incision. Were this neglected, the union below would be unequal, and, through an injudicious economy, a degree of deformity would remain, which is always unpleasant, when it can be avoided. The grand object, however, is to make the two incisions diverge at an acute angle, so that the edges may be put into reciprocal contact their whole length, without the least inequality.

M. Louis used to operate as follows: the patient being seated in a good light, his head is to be supported on an assistant's breast, who, with the fingers of both hands, pushes the cheeks forward, in order to bring the edges of the fissure near to each other. These are to be laid on a piece of pasteboard, which is to be put between the jaw and lip, and be an inch and a half long, from twelve to fifteen lines broad, and at most one line thick. The upper end should be rounded, by flattening the corners. To facilitate the incision, the lip is to be stretched over the pasteboard, the operator holding one portion over the right with the thumb and index finger of the left hand, while the assistant does the same thing on the left side. Things being thus disposed, the edges of the hare-lip are to be cut off with two sweeps of the bistoury, in two oblique lines, forming an acute angle above the fissure.

For a long while scissars were preferred to a knife, for cutting off the edges of the hare-lip; but, they are now very generally disused for this purpose. The pinching and bruising, which result from the action of the two blades, in overlapping each other, are deemed obstacles to the union of the sides of the wound; for, the bruised fibres must necessarily suppurate; and, slight as this may be, the cure is at least retarded by it. Let not practitioners be led by Mr. B. Bell's stating, that in one instance he cut off one side of the fissure with a knife, and the other with scissars; that the latter cut produced least pain, and that on this side there was no more swelling nor inflammation than on the opposite one.

The pins should be introduced at least two-thirds of the way through the substance of the lip, lest a furrow should remain on the inside of the part, which might prove troublesome, by allowing pieces of food to lodge in it. There is, however, a stronger reason for attending to this circumstance, viz: the hemorrhage which may take place when it is neglected. The bleeding almost always ceases, as soon as the edges of the wound have been brought together by means of the suture, when the pins are properly placed; but, when they have not been introduced deeply enough, the posterior surfaces of the incisions not been applied to each other, the blood may continue to run into the mouth, and give the surgeon an immense deal of trouble. In the memoir written by Louis, there is a history of a case, in which the patient died in consequence of such an accident. Persons who had undergone the operation, were always advised to swallow their spittle, even though mixed with blood, in order to avoid disturbing the wound, by getting rid of it otherwise. In the case alluded to, the patient, who had been operated upon for a cancerous affection of the lip, swallowed the blood as he had been directed to do, and he bled so profusely that he died. On the examination of the body, the stomach, and small intestines were found full of blood. "This deplorable case," says the illustrious author who relates it, "deserves to be recorded for public instruction, for the purpose of keeping alive the attention of surgeons on all occasions, where, in consequence of any operation whatsoever, there is reason to apprehend bleeding in the cavity of the mouth. Platner is the only writer who, as far as I know, foresaw this kind of danger. The bleeding from the edges of the wound stops of itself, (says he) as soon as they have been brought into contact, and stitched together; but, care must be taken that the patient does not swallow the blood, which might make him vomit, or else suffocate him. Hence, his head should be elevated, that the blood may escape externally, a precaution more particularly necessary in regard to young children."

Having described the mode of operating for the hare-lip, as approved of by the generality of practitioners, and detailed every thing which seemed material, we have now only to describe the method which M. Louis adopted. His sentiments respecting several particular points of the operation have been already stated; and an account of the means which he employed, in lieu of the twisted suture, for uniting the edges of the wound, is all that we have to offer farther on the present subject.

Different authors, as already mentioned, have devised bandages for supporting the two portions of the divided lip, and lessening the pressure which they make against the pins designed for uniting them. Franco and Quesnay, in particular, have described two kinds, which have been considered very well calculated for this object; and these means were not only employed as auxiliary, but even sometimes as curative ones, when it was impossible to use needles. To such bandages, too complicated and too uncertain, in their effect, M. Louis prefers a simple linen roller, one inch wide, there ells long, and rolled up into two unequal heads. He begins with applying the body of this bandage to the middle of the forehead; he unrolls the two heads, from before backward, above the ears between the upper part of the cartilage, and the cranium, in order to make them cross on the nape of the neck, and then be carried forward again. The assistant, who supports the head, and pushes forward the cheeks, must lift up the ends of his fingers, in the place of which, on each side, a thick compress is to be put. This being covered, and pushed from behind forward, by the roller, will constantly perform the office of the assistant's fingers, who is to continue to support the apparatus, until it is all completely applied. The longest of the two heads of the roller, being slit in two places near the lip, presents two parallel openings; the remnant of the shortest one is divided into two parts, as far as its ends. The two little narrow bands, in which it terminates, must be passed through the openings of the former, and made to cross upon the middle of the lip. The ends of the roller, being carried from before backward, are then to be made to cross again on the nape of the neck, where the shortest is to end. The remainder of the long one is to be employed in making turns round the head. This bandage may be rendered much more stable, by a piece of tape, which is to pass the forehead, over the sagittal suture, and be pinned at each end to the circumvolutions of the roller; while a second piece of tape is to cross the first one at the top of the head, and also to be attached, at its extremities, to the uniting bandage, and the compresses, placed under the zygomatic arches, for the purpose of pushing forward the cheeks.

This bandage is extremely simple, and would promise great advantages, if the twisted suture were unknown to practitioners. This last means will, I think, always be the favourite of the practical surgeon, because the desired effect can be produced by it, with much less trouble, than must be taken with the bandage, in order to render the operation of the latter sufficiently certain. Besides, as we have noticed, M. Louis himself mostly made one stitch near the red part of the lip, so that he cannot be said to have trusted altogether to the bandage.

All that we have said concerning the operation for the hare-lip, is equally applicable, not only to the treatment of cancer of the lip, but also to that of accidental cuts, or lacerations, of this part, from any cause whatsoever. We shall only remark that, in a recent wound, all the duty of the surgeon is to have recourse immediately, either to the twisted suture, or the uniting bandage.

In cases, in which the fissure affects the bones forming the roof of the mouth, after the soft parts have been united in the manner above related, the bones, and other separated parts, are ordinarily observed to become approximated, and nature thus corrects, more or less, this kind of deformity. But this does not always happen, and when these parts remain so considerably separated, as to obstruct speech and deglutition, or cause any other inconvenience, a plate of gold or silver, exactly adapted to the arch of the palate, and steadied by means of a piece of sponge, fixed to its convex side, and introduced into the cleft, may sometimes be usefully employed. When the sponge is of suitable size, and very dry, before being used, it will be swelled by the moisture of the adjacent parts, which alone will be sufficient, in many cases, to keep it in its situation, so as greatly to facilitate speaking and swallowing. Sometimes, however, the fissure is so shaped, that the sponge cannot be fixed in it: this principally happens when the opening widens very much, towards the front of the jaw. In such cases it has been proposed to fix a plate of gold, by means of springs, made of the same metal, so constructed as to fit the cavity; but, no contrivance seems yet to have answered.

On the subject of the hare-lip, consult *B. Bell's Surgery, Vol. 4. Heister's Surgery. Le Dran's Operations; Sharp's Operations; Latta's Surgery, Vol. 2; L'Encyclopédie Méthodique, Partie Chirurgicale, Art. Bec de Lievre. The Observations of M. Louis in Mém. de l'Acad. de Chirurgie, Tom. 4. in 4to. De la Medecine Opératoire, par Sabatier, Tom. 3. Œuvres Chirurgicales de Desault, par Bichat, Tom. 2. Traité des Opérations de Chirurgie, par A. Bertrandi, Chap. 19. Richter's Anfangsgrunde der Wundarzneykunst, Band 2. Kap. 7. Richerand's Nosographie Chirurgicale, Tom. 3. p. 255, &c. Edit. 4. Lassus, Pathologie Chirurgicale, Tom. 2, p. 451, &c. Edit. 2.*

**HEAD, INJURIES OF.** Mr. Pott remarks, that, though the scalp be called the common tegument of the head, yet, from the variety of parts of which it is composed, from their structure, connexions, and uses, injuries done to it by external violence, become of much more consequence, than the same kind of ills can prove, when inflicted on the common teguments of the rest of the body.

Passing over incised wounds, which have no particularity, Mr. Pott proceeds immediately to those which, (though the mischief is originally confined to the mere scalp) yet are frequently very terrible to behold, often attended with alarming symptoms, and sometimes with danger. Lacerated and punctured wounds, are those referred to. "The former may be reduced to two kinds, viz. those in which the scalp, though torn, or unequally divided, still keeps its natural situation, and is not stript nor separated from the cranium, to any considerable distance beyond the breadth of the wound; and those, in which it is considerably detached from the parts it ought to cover.

"The first of these, if simple, and not combined with the symptoms, or appearances of any other mischief, do not require any particular or different treatment, from what the same kind of wounds require on all other parts; but the latter, (those in which the scalp is separated and detached from the parts it ought to cover) are not only, by the different methods in which they may be treated, frequently capable of being cured with a considerable deal more or less ease and expedition, but are also sometimes a matter of great consequence to the health and well-being of the patient."

Mr. Pott makes no scruple of declaring it as his opinion, that the preservation of the scalp ought always to be attempted, *unless it be so torn as to be absolutely spoiled, or there are manifest present symptoms of other mischief.* This kind of wound is sometimes very terrible to look at, and they who have not been accustomed to see it, may be inclined to think there is no remedy but excision; but Mr. Pott says, he has so often made the experiment of endeavouring to preserve the torn piece, and so often succeeded, that he would recommend it as a thing always to be attempted, even though a part of the cranium should be perfectly bare. The removal of it necessarily produces a larger sore, which must require a good deal of time to heal, and must leave considerable deformity: the preservation of it prevents both.

Here we may remark, that all practitioners now invariably avoid cutting away the scalp, even in the circumstances, in which such practice was allowed by Pott. By *spoiled* this eminent writer must mean so injured as necessarily to slough afterwards. However, as no harm results from taking the chance of its not sloughing, which never can be with certainty foretold; and as the excision of the part is painful, and productive of no benefit, even if sloughing must follow, such operation is, in every point of view, quite wrong. With respect to other mischief, as a reason, the examination of the cranium, and even trephining, never require any of the scalp to be cut away. See *Trephine.*

Let the surgeon, therefore, always make the torn piece clean from all dirt, or foreign bodies, and restore it as quickly, and as perfectly as he can, to its natural situation.

Notwithstanding Mr. Pott assents to the employment of sutures, for uniting certain lacerated wounds of the scalp, we may state, that the best practitioners of the present day only employ sticking-plaster. Sometimes, the loosened scalp will unite with the parts from which it was torn and separated, and there will be no other sore than what arises from the impracticability of bringing the lips of the wound into smooth and immediate contact, the scar of which sore must be small in proportion. Sometimes such perfect re-union is not to be obtained; in which case, matter will be formed and collected in those places where the parts do not coalesce: but this does not necessarily make any difference, either in the general intention, or in the event; this matter may easily be discharged, by one or two small openings made with a lancet; the head will still preserve its natural covering; and the cure will be very little retarded by a few small abscesses.

In some cases (as Pott proceeds to describe), the whole separated piece will unite perfectly, and give little or no trouble, especially in young and healthy persons. In some, the union will take place in some parts and not in others; and, consequently, matter will be formed, and require to be discharged, perhaps at several different points; and, in some particular cases, circumstances, and habits, there will be no union at all, the torn cellular membrane, or the naked aponeurosis, will inflame, and become sloughy, a considerable quantity of matter will be collected, and, perhaps, the cranium will be denuded. But, even in this state of things, which does not very often happen, where care has been taken, and is almost the worst which can happen, in the case of mere simple laceration and detachment, if the surgeon will not be too soon, nor too much alarmed, nor in a hurry to cut, he will often find the cure much more feasible than he may at first imagine: let him take care to keep the inflammation under by proper means, let him have patience till the matter is fairly and fully formed, and the sloughs perfectly separated, and when this is accomplished, let him make a proper number of dependent openings for the discharge of them, and let him by bandage, and other proper management, keep the parts in constant contact with each other, and he will often find, that although he was foiled in his first intention of procuring immediate union, yet he will frequently succeed in this his second; he will still save the scalp, shorten the cure, and prevent the great deformity arising, (particularly to women) not only from the scar, but from the total loss of hair.

This union may often be procured, even though the cranium should have been perfectly denuded by the accident; and, it is true, not only though it should have been stripped of its pericranium at first, but even if that pericranium should have become sloughy and cast off, as Mr. Pott has often seen.

"Exfoliation from a cranium laid bare by external violence, and to which no other injury has been done, than merely stripping it of its covering, is a circumstance (says Pott) which would not so often happen, if it was not taken for granted that it must be, and the bone treated according to such expectation. The soft open texture of the bones of children and young people, will frequently furnish an incarnation, which will cover their surface, and render exfoliation quite unnecessary; and even in those of mature age, and in whom the bones are still harder, exfoliation is full as often the effect of art as the intention of nature, and produced by a method of dressing, calculated to accomplish such end, under a supposition of its being necessary. Sometimes, indeed, it happens that a small scale will necessarily separate, and the sore cannot be perfectly healed till such separation has been made; but this kind of exfoliation will be very small and thin, in proportion to that produced by art, that is, that produced by dressing the surface of the bare bone with spirituous tinctures, &c.

"Small wounds, that is, such as are made by instruments, or bodies which pierce, or puncture, rather than cut, are in general more apt to become inflamed, and to give trouble, than those which are larger, and in this part, particularly, are sometimes attended with so high inflammation, and with such symptoms as alarm both patient and surgeon."

The parts capable of being hurt by such kind of wound, are the skin, the cellular membrane, the expanded tendons of the muscles of the scalp, and the pericranium.

"If the wound affects the cellular membrane only, and has not reached the aponeurosis or pericranium, the inflammation and tumour affect the whole head and face, the skin of which wears a yellowish cast, and is sometimes thick set with small blisters, containing the same coloured serum; it receives the impression of the fingers, and becomes pale for a moment, but returns immediately to its inflamed colour; it is not very painful to the touch, and the eye-lids and ears are always comprehended in the tumefaction, the former of which are sometimes so distended, as to be closed; a feverish heat and thirst generally accompany it; the patient is restless, has a quick pulse, and most commonly a nausea, and inclination to vomit.

"This accident generally happens to persons of bilious habit, and is indeed an inflammation of the erysipelatous kind; it is somewhat alarming to look at, but is not often attended with danger. The wound does indeed neither look well, nor yield a kindly discharge, while the fever continues, but still it has nothing threatening in its appearance, none of that look which bespeaks internal mischief; the scalp continues to adhere firmly to the skull, and the patient does not complain of that tensive pain, nor is afflicted with that fatiguing restlessness which generally attends mischief underneath the cranium.

"Phlebotomy, lenient purges, and the use of the common febrifuge medicines, particularly those of the neutral kind, generally remove it in a short time. When the inflammation is gone off, it leaves on the skin a yellowish tint, and a dry scurf, which continue until perspiration carries them away, and upon the disappearance of the disease, the wound immediately recovers a healthy aspect, and soon heals without any farther trouble.

"Wounds and contusions of the head, which affect the brain and its membranes, are also subject to an erysipelatous kind of swelling and inflammation; but it is very different, both in its character and consequences, from the preceding.

"In this, (which is one of the effects of inflammation of the meninges,) the febrile symptoms are much higher, the pulse harder and more frequent, the anxiety and restlessness extremely fatiguing, the pain in the head intense; and as this kind of appearance is, in these circumstances, most frequently the immediate precursor of matter forming between the skull and dura mater, it is generally attended with irregular shiverings, which are not followed by a critical sweat, nor afford any relief to the patient. To which it may be added, that in the former case the erysipelas generally appears within the first three or four days; whereas in the latter, it seldom comes on till several days after the accident, when the symptomatic fever is got to some height. In the simple erysipelas, although the wound be crude and undigested, yet it has no other mark of mischief; the pericranium adheres firmly to the skull, and upon the cessation of the fever, all appearances become immediately favourable. In that which accompanies injury done to the parts underneath, the wound not only has a spongy, glassy, unhealthy aspect, but the pericranium in its neighbourhood separates spontaneously from the bone, and quits all cohesion with it. In short, one is an accident, proceeding from a bilious habit, and not indicating any mischief beyond itself; the other is a symptom, or a part of a disease, which is occasioned by injury done to the membranes of the brain: one portends little or no ill to the patient, and almost always ends well; the other implies great hazard, and most commonly ends fatally. It is therefore hardly necessary to say, that it behoves every practitioner to be careful in distinguishing them from each other.

"If the wound be a small one, and has passed through the cellular membrane to the aponeurosis, and pericranium, it is sometimes attended with very disagreeable, and even very alarming symptoms, but which arise from a different cause, and are very distinguishable from what has been yet mentioned.

"In this, the inflamed scalp does not rise into that degree of tumefaction, as in the erysipelas, neither does it pit, or retain the impression of the fingers of an examiner; it is of a deep red colour, unmixt with the yellow tint of the erysipelas; it appears tense, and is extremely painful to the touch; as it is not an affection of the cellular membrane, and as the ears and the eye-lids are not covered by the parts in which the wound is inflicted, they are seldom, if ever, comprehended in the tumour, though they may partake of the general inflammation of the skin; it is generally attended with acute pain in the head, and such a degree of fever as prevents sleep, and sometimes brings on a delirium.

"A patient in these circumstances, will admit more free evacuations by phlebotomy, than one labouring under an erysipelas; the use of warm fomentation is required in both, in order to keep the skin clean and perspirable, but an emollient cataplasm, which is generally forbid in the former, may in this latter case be used to great advantage.

"When the symptoms are not very pressing, nor the habit very inflammable, this method will prove sufficient; but it sometimes happens, that the scalp is so tense, the pain so great, and the symptomatic fever so high, that by waiting for the slow effect of such means, the patient runs a risk from the continuance of the fever, or else the injured aponeurosis and pericranium becoming sloughy, produce an abscess, and render the case both tedious and troublesome. A division of the wounded part by a simple incision down to the bone, about half an inch or an inch in length, will most commonly remove all the bad symptoms, and if it be done in time, will render every thing else unnecessary." (*Pott.*)

The injuries, to which the scalp is liable from contusion, or the appearances produced in it by such general cause, may be divided into those in which the mischief is confined merely to the scalp; and those in which other parts are interested.

The former, which only comes under our present consideration, is not indeed of importance, considered abstractedly. The tumour attending it is either very easily dissipated, or the extravasated blood causing it, is easily got rid of by a small opening. Mr. Pott particularly notices this case, on account of an accidental circumstance, which sometimes attends it, and renders it liable to be very much mistaken.

"When the scalp receives a very smart blow, it often happens that a quantity of extravasated blood immediately forms a tumour, easily distinguishable from all others, and generally very easily cured. But it also sometimes happens, that this kind of tumour produces to the fingers of an unadvised or inattentive examiner, a sensation, so like to that of a fracture, with depression of the cranium, as may be easily mistaken." Now, if, upon such supposition, a surgeon immediately makes an incision into the tumid scalp, he may give his patient a great deal of unnecessary pain, and for that reason run some risk of his own character.

"The touch is, in this case, so liable to deception, that recourse should always be had to other circumstances and symptoms, before an opinion be given.

"If a person, with such tumour occasioned by a blow, and attended with such appearances, and feel, has any complaint, which seems to be the effect of pressure made on the brain and nerves, or of any mischief done to the parts within the cranium, the division or removal of the scalp in order to enquire into the state of the skull, is right and necessary; but if there are no such general symptoms, and the patient is in every respect perfectly well, the mere feel of something like a fracture will not authorize or vindicate such operation, since it will often be found, that such sensation is a deception, and that when the extravasated fluid is removed, or dissipated, the cranium is perfectly sound and uninjured.

"The second kind of tumour attending the contused scalp, viz. that which arises from injury done to the cranium, and parts within, does so absolutely proceed from and depend upon such injury, as not to fall under our consideration in this place at all, but will be considered at large when we come to speak of the mischiefs done to the skull and brain by collision, or contusion.

"From what has been said it appears, that the scalp, taken in a general sense, is, when wounded or bruised, liable to be affected with four kinds of tumour, each of which has a distinct cause, and requires, or permits, a different method of treatment.

"The first does not imply any injury done to the parts within the skull, requires no operation, and almost always is cured by general remedies.

"The second, or that which is caused by the spontaneous separation of the pericranium from the skull, in consequence of internal mischief, is not at first attended with very pressing symptoms; but whoever has observed their progress, and attended to their event, must know what fatal and frequently irresistible evil it is the forerunner of, nothing less than the inflammation and putrefaction of the membranes of the brain, and the formation of matter between them and the skull; and that is a case which, of all others, will least admit delay.

"The third, though it sometimes gives way to free evacuation, and lenient external applications, yet is sometimes also attended with symptoms which are too pressing to wait the effect of such remedies, and is capable of being immediately relieved by a division of the inflamed and irritated parts: whereas the same incision, made into the first kind of tumefaction, would most probably exasperate the disease, and heighten the symptoms.

"The fourth, consisting of extravasated blood, seldom requires any chirurgic operation; time, and the use of the common discutient applications, (of which the *lotio, ammoniæ muriatis* is best,) almost always dissipate it; and it only becomes of consequence, by the possibility of its being misunderstood and mistreated."—(*Pott on Injuries of the Head.*)

### 2. *Effects of Contusion on the Dura Mater and Parts within the Skull.*

It is observed by Mr. Pott, that "the dura mater does on the internal surface of the bones of the cranium, the office of periosteum, in the same manner as the pericranium does on the external; (at least they have no other:) to this it is so firmly, and so generally attached, as to be incapable of any, even the smallest degree of motion. The alternate elevation and subsidence of it, which are observable when any portion of it is laid bare, are owing to a very different cause from any power in itself; neither is, nor can ever be performed, until a piece of the cranium has been forcibly taken away; and consequently cannot possibly be natural, or necessary.

"By blows, falls, and other shocks, some of the larger of those vessels which carry on this communication between the dura mater and the skull are broken, and a quantity of blood is shed upon the surface of that membrane. This is one species of bloody extravasation, and indeed the only one which can be formed between the skull and dura mater. If the broken vessels be few, and the quantity of blood which is shed be small, the symptoms are generally slight, and by proper treatment disappear. If they are large, or numerous, or the quantity of extravasated fluid considerable, the symptoms are generally urgent in proportion; but whether they be slight, or considerable, whether immediately alarming or not, they are always, and uniformly, such as indicate pressure made on the brain and nerves, viz. stupidity, drowsiness, diminution or loss of sense, speech, and voluntary motion.

"This every practitioner knows to be one frequent consequence of blows on the head. But it also often happens, from the same kind of violence, that some of the small vessels, which carry on the circulation between the pericranium, skull, and dura mater, are so damaged, as not to be able properly to execute that office, although there are none so broken as to cause an actual effusion of blood.

"Smart and severe strokes on the middle part of the bones, at a distance from the sutures, are most frequently followed by this kind of mischief; the coats of the small vessels, which sustain the injury, inflame and become sloughy, and, in consequence of such alteration in them, the pericranium separates from the outside of that part of the bone, which received the blow, and the dura mater from the inside, the latter of which membranes, soon after such inflammation, becomes sloughy also, and furnishes matter, which matter being collected between the said membrane and the cranium, and having no natural outlet, whereby to escape, or be discharged, brings on a train of very terrible symptoms, and is a very frequent cause of destruction. The effect of this kind of violence is frequently confined to the vessels connecting the dura mater to the cranium, in which case the matter is external to the said membrane; but it sometimes happens, that by the force either of the stroke or of the concussion, the vessels which pass between and connect the two meninges are injured in the same manner; in which case, the matter formed in consequence of such violence is found on the surface of the brain, or between the pia and dura mater, as well as on the surface of the latter; or perhaps in all these three situations at the same time.

"The difference of this kind of disease, from either an extravasation of blood, or a commotion of the medullary parts of the brain, is great and obvious. All the complaints produced by extravasation, are, such as proceed from pressure made on the brain and nerves, and obstruction to the circulation of the blood through the former; stupidity, loss of sense and voluntary motion, laborious and obstructed pulse and respiration, &c. and (which is of importance to remark,) if the effusion be at all considerable, these symptoms appear immediately, or very soon after the accident.

"The symptoms attending an inflamed or sloughy state of the membranes, in consequence of external violence, are very different; they are all of the febrile kind, and never, at first, imply any unnatural pressure; such are, pain in the head, restlessness, want of sleep, frequent and hard pulse, hot and dry skin, flushed countenance, inflamed eyes; nausea, vomiting, rigor; and toward the end, convulsion, and delirium. And none of these appear at first, that is, immediately after the accident; seldom until some days are past.

"One set or class of symptoms is produced by an extravasated fluid, making such pressure on the brain and origin of the nerves, so as to impair or abolish voluntary motion and the senses; the other is caused by the inflamed or putrid state of the membranes covering the brain, and seldom affects the organs of sense, until the latter end of the disease, that is, until a considerable quantity of matter is formed, which matter must press like any other fluid."

"If there be neither fissure nor fracture of the skull, nor extravasation, nor commotion underneath it, and the scalp be neither considerably bruised, nor wounded, the mischief is seldom discovered or attended to for some few days. The first attack is generally by pain in the part which received the blow. This pain, though beginning in that point, is soon extended all over the head, and is attended with a langour, or dejection of strength and spirits, which are soon followed by a nausea, and inclination to vomit, a vertigo or giddiness, a quick and hard pulse, and an incapacity of sleeping, at least quietly. A day or two after this attack, if no means preventive of inflammation are used, the part stricken generally swells, and becomes puffy, and tender, but not painful; neither does the tumour rise to any considerable height, or spread to any great extent: if this tumid part of the scalp be now divided, the pericranium will be found of a darkish hue; and either quite detached, or very easily separable from the skull, between which and it will be found a small quantity of a dark-coloured ichor.

"If the disorder has made such progress, that the pericranium is quite separated and detached from the skull, the latter will even now be found to be somewhat altered in colour from a sound healthy bone. Of this alteration it is not very easy to convey an idea by words, but it is a very visible one, and what some very able writers have noticed.

"From this time the symptoms generally advance more hastily and more apparently; the fever increases, the skin becomes hotter, the pulse quicker and harder, the sleep more disturbed, the anxiety and restlessness more fatiguing; and to these are generally added irregular rigors, which are not followed by any critical sweat, and which, instead of relieving the patient, add considerably to his sufferings. If the scalp has not been divided or removed, until the symptoms are thus far advanced, the alteration of the colour of the bone will be found to be more remarkable; it will be found to be whiter and more dry than a healthy one; or, as Fallopius has very justly observed, it will be found to be more like a dead bone: the sanies, or fluid, between it and the pericranium will also, in this state, be found to be more in quantity, and the said membrane will have a more livid diseased aspect.

"In this state of matters, if the dura mater be denuded, it will be found to be detached from the inside of the cranium, to have lost its bright silver hue, and to be, as it were, smeared over with a kind of mucus, or with matter, but not with blood. Every hour after this period, all the symptoms are exasperated, and advance with hasty strides: the head-ach and thirst become more intense, the strength decreases, the rigors are more frequent, and at last convulsive motions, attended in some with delirium, in others with paralysis, or comatose stupidity, finish the tragedy.

"If the scalp has not been divided till this point of time, and it be done now, a very offensive discoloured kind of fluid will be found lying on the bare cranium, whose appearance will be still more unlike to the healthy natural one; if the bone be now perforated, matter will be found between it and the dura mater, generally in considerable quantity, but different in different cases and circumstances. Sometimes it will be in great abundance, and diffused over a very large part of the membrane; and sometimes the quantity will be less, and consequently the space which it occupies smaller. Sometimes it lies only on the exterior surface of the dura mater; and sometimes it is between it and the pia mater, or also even on the surface of the brain, or within the substance of it.

"The primary and original cause of all this, is the stroke upon the skull: by this the vessels which should carry on the circulation between the scalp, pericranium, skull, and meninges, are injured, and no means being used to prevent the impending mischief, or such as have been made use of proving ineffectual, the necessary and mutual communication between all these parts ceases, the pericranium is detached from the skull, by means of a sanies discharged from the ruptured vessels, the bone being deprived of its due nourishment and circulation loses its healthy appearance, the dura mater (its attaching vessels being destroyed, or rendered unfit for their office) separates from the inside of the cranium, inflames and suppurates.

"Whoever will attend to the appearances which the parts concerned make in every stage of the disease, to the nature of the symptoms, the time of their access, their progress, and most frequent event, will find them all easily and fairly deducible from the one cause, which has just been assigned, viz. the contusion. As the inflammation and separation of the dura mater, is not an *immediate* consequence of the violence, so neither are the symptoms immediate, seldom until some days have passed; the fever at first is slight, but increases gradually; as the membrane becomes more and more diseased, all the febrile symptoms are heightened; the formation of matter occasions rigors, frequent and irregular, until such a quantity is collected, as brings on delirium, spasm, and death."

Hitherto Mr. Pott has been describing this disease as unaccompanied with any other, not even with any external mark of injury, except perhaps a trifling bruise of the scalp; "Let us now, (says this eminent surgeon,) suppose the scalp to be wounded at the time of the accident, by whatever gave the contusion; or let us suppose, that the immediate symptoms having been alarming, a wound had been made, in order to examine the skull.

"In this case, the wound will for some little time have the same appearance as a mere simple wound of this part, unattended with other mischief, would have; it will, like that, at first discharge a thin sanies, or gleet, and then begin to suppurate; it will digest, begin to incarn, and look perfectly well; but, after a few days, all these favourable appearances will vanish; the sore will lose its florid complexion, and granulated surface; will become pale, glassy, and flabby; instead of good matter, it will discharge only a thin discoloured sanies; the lint with which it is dressed, instead of coming off easily (as in a kindly suppurating sore) will stick to all parts of it; and the pericranium, instead of adhering firmly to the bone, will separate from it, all round, to some distance from the edges.

"This alteration in the face and circumstances of the sore, is produced merely by the diseased state of the parts underneath the skull; which is a circumstance of great importance, in support of the doctrine advanced; and is demonstrably proved, by observing that this diseased aspect of the sore, and this spontaneous separation of the pericranium, are always confined to that part which covers the altered or injured portion of the dura mater, and do not at all affect the rest of the scalp; nay, if it has by accident been wounded in any other part, or a portion has been removed from any part where no injury has been done to the dura mater, no such separation will happen, the detachment above will always correspond to that below, and be found no where else.

"The first appearance of alteration in the wound immediately succeeds the febrile attack; and as the febrile symptoms increase, the sore becomes worse and worse, that is, degenerates more and more from a healthy, kindly aspect.

"Through the whole time, from the first attack of the fever, to the last and fatal period, an attentive observer will remark the gradual alteration of the colour of the bone, if it be bare. At first it will be found to be whiter, and more dry, than the natural one; and as the symptoms increase, and either matter is collected, or the dura mater becomes sloughy, the bone inclines more and more to a kind of purulent hue, or whitish yellow; and it may also be worth while in this place to remark, that if the blow was on or very near to a suture, and the subject young, the said suture will often separate in such a manner as to let through it a loose, painful, ill-natured fungus; at which time also it is no uncommon thing for the patient's head and face to be attacked with an erysipelas.

"In those cases, in which the scalp is very little injured by the bruise, and in which there is no wound, nor any immediate alarming symptoms or appearances, the patient feels little or no inconvenience, and seldom makes any complaint, until some few days are past. At the end of this uncertain time, he is generally attacked by the symptoms already recited; these are not pressing at first, but they soon increase to such a degree, as to baffle all our art: from whence it will appear, that when this is the case, the patient frequently suffers from what seems at first to indicate his safety, and prevents such attempts being made, and such care from being taken of them, as might prove preventive of mischief.

"But if the integuments are so injured as to excite or claim our early regard, very useful information may from thence be collected; for whether the scalp be considerably bruised, or whether it be found necessary to divide it for the discharge of extravasated blood, or on account of worse appearances, or more urgent symptoms, the state of the pericranium may be thereby sooner and more certainly known: if in the place of such bruise, the pericranium be found spontaneously detached from the skull, having a quantity of discoloured sanies between them under the tumid part, in the manner already mentioned, it may be regarded as a pretty certain indication, either that the dura mater is beginning to separate in the same manner, or that if some preventive means be not immediately used, it will soon suffer; that is, it will inflame, separate from the skull, and give room for a collection of matter between them. And with regard to the wound itself, whether it was made at the time of the accident, or afterward artificially, it is the same thing; if the alteration of its appearance be as related, if the edges of it spontaneously quit their adhesion to the bone, and the febrile symptoms are at the same time making their attack, these circumstances will serve to convey the same information, and to prove the same thing.

"This particular effect of contusion is frequently found to attend on fissures, and undepressed fractures of the cranium, as well as on extravasations of fluid, in cases where the bone is entire; and, on the other hand, all these do often happen without the concurrence of this individual mischief. All this is matter of accident; but let the other circumstances be what they may, the spontaneous separation of the altered pericranium, in consequence of a severe blow, is almost always followed by a suppuration between the cranium and dura mater; a circumstance extremely well worth attending to in fissures and undepressed fractures of the skull, because it is from this circumstance principally, that the bad symptoms, and the hazard, in such cases arise.

"It is no very uncommon thing for a smart blow on the head to produce some immediate bad symptoms, which after a short space of time disappear, and leave the patient perfectly well. A slight pain in the head, a little acceleration of pulse, a vertigo and sickness, sometimes immediately follow such accident, but do not continue many hours, especially, if any evacuation has been used. These are not improbably owing to a slight commotion of the brain, which having suffered no material injury thereby, soon cease. But if, after an interval of some time, the same symptoms are renewed; if the patient, having been well, becomes again feverish, and restless, and that without any new cause; if he complains of being languid and uneasy, sleeps disturbedly, loses his appetite, has a hot skin, a hard quick pulse, and a flushed, heated countenance; and neither irregularity of diet, nor accidental cold, have been productive of these; mischief is most certainly impending, and that most probably under the skull.

"If the symptoms of pressure, such as stupidity, loss of sense, voluntary motion, &c. appear some few days after the head has suffered injury from external mischief, they do most probably imply an effusion of a fluid somewhere: this effusion may be in the substance of the brain, in its ventricles, between its membranes, or on the surface of the dura mater; and which of these is the real situation of such extravasation, is a matter of great uncertainty, none of them being attended with any peculiar mark or sign that can be depended upon, as pointing it out precisely; but the inflammation of the dura mater, and the formation of matter between it and the skull, in consequence of contusion, is generally indicated and preceded by one which Mr. Pott has hardly ever known to fail; a puffy, circumscribed, indolent tumour of the scalp, and a spontaneous separation of the pericranium from the skull under such tumour.

"These appearances, therefore, following a smart blow on the head, and attended with languor, pain, restlessness, watching, quick pulse, head-ach, and slight irregular shiverings, do almost infallibly indicate an inflamed dura mater, and pus, either forming or formed, between it and the cranium."

By detachment of the pericranium, is not meant every separation of it from the bone which it should cover. It may be, and often is cut, torn, or scraped off, without any such consequence; but these separations are violent, whereas that which Mr. Pott means is spontaneous, and is produced by the destruction of those vessels by which it was connected with the skull, and by which the communication between it and the internal parts was carried on; and therefore it is to be observed, that it is not the mere removal of that membrane which causes the bad symptoms, but it is the inflammation of the dura mater; of which inflammation, this spontaneous secession of the pericranium is an almost certain indication.

Sometimes the scalp is so wounded at the time of the accident, or so torn away, as to leave the bone perfectly bare; and yet the violence has not been such as to produce the evil just now spoken of. In this case, if the pericranium be only turned back, along with the detached portion of scalp, there may be probability of its reunion; and it should therefore be immediately made clean and replaced, for the purpose of such experiment; which, if it succeeds, will save time, and prevent considerable deformity. Should the attempt fail, it can only be in consequence of the detached part sloughing. Hence, removing it with a knife, though allowed by Pott, is now never practised. Frequently, when the scalp does not adhere at once, it becomes attached to the cranium afterwards by a granulating process. When the detached piece sloughs, the worst that can happen, is an exfoliation from the bare skull.

Sometimes, the force which detaches, or removes the scalp, also occasions the mischief in question; but, the integuments being wounded or removed, we cannot have the criterion of the tumour of the scalp for the direction of our judgment. Our whole attention must be directed to the wound and general symptoms. The edges of the former will digest as well, and look as kindly, for a few days, as if no mischief was done underneath. But, after some little space of time, when the patient begins to be restless, and hot, and to complain of pain in the head, these edges will lose their vermilion hue, and become pale and flabby. Instead of matter, they will discharge a thin gleet, and the pericranium will loosen from the skull, to some distance from the said edges. Immediately after this, all the general symptoms are increased and exasperated; and as the inflammation of the membrane is heightened, or extended, they become daily worse and worse, until a quantity of matter is formed, and collected, and brings on that fatal period, which, though uncertain as to date, very seldom fails to arrive.

"The method of attempting the relief of this kind of injury consists in two points, viz. to endeavour to prevent the inflammation of the dura mater; or, that being neglected, or found impracticable, to give discharge to the fluid collected within the cranium, in consequence of such inflammation.

"Of all the remedies in the power of art, for inflammations of membranous parts, there is none equal to phlebotomy. To this truth many diseases bear testimony; pleurisies, ophthalmies, strangulated hernias, &c. and if any thing can particularly contribute to the prevention of the ills likely to follow severe contusions of the head, it is this kind of evacuation; but then it must be made use of in such a manner as to become truly a preventive; that is, it must be made use of immediately, and freely."

This eminent surgeon says, he is very sensible that it will in general be found very difficult to persuade a person, who has had what may be called only a knock on the pate, to submit to such discipline, especially if he finds himself tolerably well: yet, in many instances, the timely use, or the neglect of this single remedy, makes all the difference between safety and fatality.

"It may be said, that as the force of the blow, the height of the fall, the weight of the instrument, &c. can never precisely, or certainly determine the effect, nor inform us, whether mischief is done under the bone, or not, a large quantity of blood may be drawn off unnecessarily, in order to prevent an imaginary evil. This is in some degree true; and if the advice just given was universally followed, many people would be largely bled without necessity; but then, on the other hand, many a very valuable life would be preserved, which, for want of this kind of assistance, is lost. *Nihil interest, præsidium an satis tutum sit, quod unicum est*, is an incontested maxim in medicine; and if it be allowed to use such means as may be in themselves hazardous, surely it cannot be wrong to employ one which is not so; at least, if it be considered in a general sense, whatever it may accidentally prove to some few particular individuals."

Acceleration, or hardness of pulse, restlessness, anxiety, and any degree of fever, after a smart blow on the head, are always to be suspected and attended to. Immediate, plentiful, and repeated evacuations by bleeding, have, in many instances, removed these, in persons to whom, Mr. Pott verily believes, very terrible mischief would have happened, had not such precaution been used. In this, as well as some other parts of practice, we neither have, nor can have any other method of judging, than by comparing together cases apparently similar. Mr. Pott has more than once or twice seen that increased velocity and hardness of pulse, and that oppressive languor, which most frequently precede mischief under the bone, removed by free and repeated blood-letting; and has often, much too often, seen cases end fatally, whose beginnings were full as slight, but in which such evacuation had been either neglected, or not complied with. This judicious writer, "would by no means be thought to infer from hence, that early bleeding will always prove a certain preservative; and that they only die, to whom it has not been applied: this, like all other human means, is fallible; and, perhaps, there are more cases out of its reach, than within it: but, where preventive means can take place, this is certainly the best, and the most frequently successful.

"The second intention, viz. the discharge of matter, collected under the cranium, can be answered only by the perforation of it.

"When, from the symptoms and appearances already described, there is just reason for supposing matter to be formed under the skull, the operation of perforation cannot be performed too soon; it seldom happens, that it is done soon enough.

"The propriety, or impropriety, of applying the trephine, in cases where there is neither fissure, fracture, nor symptom of extravasation, is a point which has been much litigated, and remains still unsettled either by writers or practitioners.

"When there is no reason for suspecting any of those injuries, either from the symptoms, or from the appearances; and the pericranium, whether the scalp be wounded or not, remains firmly attached in all parts to the skull; there certainly is not (let the general symptoms be what they may) any indication where to apply the instrument, and consequently no sufficient authority for using it at all: but whenever that membrane, after the head has received an external violence, separates, or is detached spontaneously from the bone underneath it, and such separation is attended with the collection of a small quantity of thin, brown ichor, an alteration of colour in the separated pericranium, and an unnatural dryness of the bone, Mr. Pott cannot help thinking, that there is as good reason for trepanning, as in the case of fracture; he believes experience would vindicate him, if he said, better reason; since it is by no means infrequent for the former kind of case to do well without such operation; whereas suppuration under the skull never can.

"The spontaneous separation of the pericranium, if attended with general disorder of the patient with chillness, horripilatio, languor, and some degree of fever, appears to Mr. Pott, from all the observation he has been capable of making, to be so sure and certain an indication of mischief underneath, either in present, or impending, that he should never hesitate about perforating the bone in such circumstances.

"When the skull has been once perforated, and the dura mater thereby laid bare, the state of the matter must principally determine the surgeon's future conduct. In some cases, one opening will prove sufficient for all necessary purposes; in others, several may be necessary. This variation will depend on the space of detached dura mater and the quantity of collected matter. The repetition of the operation is warranted, both by the nature of the case, and by the best authorities; there being no comparison to be made between the possible inconvenience arising from largely denuding the dura mater, and the certain, as well as terrible evils which must follow the formation and confinement of matter between it and the skull.

"It can hardly be necessary to observe, that notwithstanding the operation of perforation be absolutely and unavoidably necessary, yet the repetition of bloodletting or cooling laxative medicines, the use of antiphlogistic remedies, and a most strict observance of a low diet and regimen, are as indispensably requisite after such operation as before; the perforation sets the membrane free from pressure, and gives vent to collected matter, but nothing more; the inflamed state of the parts under the skull, and all the necessary consequences of such inflammation, call for all our attention, full as much afterwards as before; and although the patient must have perished without the use of the trephine, yet, the merely having used it, will not preserve him, without every other caution and care." (*Pott.*)

I think it not improper to recommend in this place to the attention of surgical practitioners, the practice of applying cold wet cloths to the head in cases of inflammation of the dura mater. It was a plan to which Schmucker ascribed a good deal of the success, with which he treated injuries of the head. I am glad to find the following recommendation of this method by a modern writer, whose opinion must have great weight: "In the inflammation, which succeeds slowly to injuries of the head, a species of inflammation not more insidious in its approach, than dangerous in its consequences, cold is by far the most efficacious remedy that has yet been discovered." (See *Thomson's Lectures on Inflammation*, p. 181.)

Both tables of the skull sometimes exfoliate in consequence of external violence. The dead bone must be removed, as soon as loose; and, if necessary, the scalp divided for the purpose.

### 3. *Fissures and Fractures of the Cranium, without Depression.*

"This kind of injury," says Mr. Pott,

"is divisible into two general heads, viz. thosein which the broken parts keep their proper level, or equality of surface, with the rest of the skull, and those in which they do not; or, in other words, fractures without depression, and fractures with.

"These two distinctions are all which are really necessary to be made, and will be found to comprehend every violent division of the parts of the skull (not made by a cutting instrument) from the finest capillary fissure, up to the most complicated fracture: for, fissures and fractures differing from each other only in the width of the breach, or in the distance of the separated parts, and the disposition of broken pieces, in large fractures, being subject to an almost infinite variety, distinctions and appellations, drawn and made from these circumstances, might be multiplied to even three times the old number, without imparting the smallest degree of useful knowledge to the man, who should be at the pains to get them by heart.

"What are the symptoms of a fractured cranium? is often asked; and there is hardly any one who does not, from the authority of writers, both ancient and modern, answer, Vomiting, giddiness, loss of sense, speech, and voluntary motion, bleeding at the ears, nose, and mouth, &c. This is the doctrine of Celsus, which has been most invariably copied by almost all succeeding authors, and implicitly believed by almost all readers.

"The symptoms just mentioned do indeed very frequently accompany a broken skull, but they are not produced by the breach made in the bone; nor do they indicate such breach to have been made. They proceed from an affection of the brain, or from injury done to some of the parts within the cranium, independent of any ill which the bones composing it may have sustained. They are occasioned by violence offered to the contents of the head in general; are quite independent of the mere breach made in the bone; and either do or do not accompany fracture, as such fracture may happen to be, or not to be, complicated with such other ills.

"They are frequently produced by extravasations of blood, or serum, upon, or between the membranes of the brain; or by shocks, or concusssions of its substance, in cases where the skull is perfectly intire and unhurt. On the other hand, the bones of the skull are sometimes cracked, broken, nay, even depressed, and the patient suffers none of these symptoms. In short, as the breach made in the bone is not, nor can be the cause of such complaints, they ought not to be attributed to it; and that for reasons, which are by no means merely speculative. For the practitioner, who supposes that such symptoms do necessarily and certainly imply that the cranium is fractured, must regulate his conduct by such supposition, and remove the scalp, very often without either necessity or benefit; that is, without discovering what he looks for: and, on the other hand, if he does find the skull to be broken, believing all these complaints to be caused by, and deducible from the fracture, he will most probably pay his whole attention to that supposed cause, and may think, that when he has done what the rules of his art prescribe for such case, he has done all that is in his power:—an opinion not unfrequently embraced; and which has been the destruction of many a patient. For, as on one hand, the loss of sense, speech, and voluntary motion, as well as the hemorrhage from the nose, ears, &c. are sometimes totally removed by, or at least disappear, during the use of free and frequent evacuation, without any operation on the scalp or skull; so, on the other, as these symptoms and appearances are not produced by the solution of continuity of the bone, they cannot be remedied by such chirurgic treatment as the mere fracture may require.

"If any one doubts the truth of this doctrine, (continues Mr. Pott,) I would desire him to consider the nature, as well as most generally successful method of treating these symptoms; and at the same time, to reflect seriously on the operation of the trepan, as practised in simple, undepressed fractures of the skull.

"The sickness, giddiness, vomiting, and loss of sense and motion, can only be the consequence of an affection of the brain, as the common sensorium. They may be produced by its having been violently shaken, by a derangement of its medullary structure, or by unnatural pressure made by a fluid extravasated on its surface, or within its ventricles; but never can be caused by the mere division of the bone, (considered abstractedly); which division, in a simple fracture, can neither press on, nor derange the structure of the parts within the cranium.

"If the solution of continuity in the bone be either produced by such a degree of violence, as hath caused a considerable disturbance in the medullary parts of the brain, or has disturbed any of the functions of the nerves going off from it; or has occasioned a breach of any vessel, or vessels, whether sanguine or lymphatic, and that hath been followed by an extravasation, or lodgment of fluid; the symptoms necessarily consequent upon such derangement, or such pressure, will follow: but they do not follow, because the bone is broken; their causes are superadded to the fracture, and, although produced by the same external violence, are yet perfectly and absolutely independent of it: so much so, that they are frequently found where no fracture is.

"The operation of the trepan is frequently performed in the case of simple fractures, and that very judiciously and properly; but it is not performed, because the bone is broken, or cracked: a mere fracture, or fissure of the skull, can never require perforation, or that the dura mater under it be laid bare; the reason for doing this, springs from other causes than the fracture, and those really independent of it: they spring from the nature of the mischief which the parts within the cranium have sustained, and not from the accidental division of the bone. From these arise the threatening symptoms; from these all the hazard; and from these, the necessity, and vindication of performing the operation of the trepan.

"If a simple fracture of the cranium was unattended in present with any of the before-mentioned symptoms, and there was no reason for apprehending any other evil in future, that is, if the solution of continuity in the bone was the whole disease, it could not possibly indicate any other curative intention, but, the general one in all fractures, viz. union of the divided parts." (*Pott.*)

I could relate numerous examples to the point, if it were any longer necessary, in the present state of surgical knowledge, to cite facts, in proof of the important truth, that the mere undepressed fissure, or fracture of the skull itself, cannot be the source of the immediate bad symptoms, but that, in these cases, the whole of the sudden peril arises, from the manner, in which the brain and its membranes have been hurt by the same violence, which caused the injury of the bone. Professor Thomson had opportunities of witnessing in the Netherlands several instances, which can leave no doubt upon this subject. "In some of the wounds (says he) in which the head had been struck obliquely by the sabre, portions of the cranium had been removed, without the brain appearing to have sustained much injury. In one case of this kind, where a considerable portion of the upper part of the occipital bone, *along with the dura mater*, had been removed, a tendency to protrusion of the brain took place during an attack of inflammation; a slight degree of stupor with loss of memory occurred; but, on the inflammatory state having been subdued, the brain sunk to its former level, the stupor went off, and the memory returned:"—and in another remarkable sabre cut, more than an inch in breadth of the left lobe of the cerebellum was exposed, and *was seen pulsating for a period of eight weeks*, yet the injury was unaccompanied with any particular constitutional symptoms. (See *Report of Observations made in the Military Hospitals of Belgium*, *p.* 50—51.)

In many cases of simple undepressed fractures of the cranium, it is true, that trephining is necessary: but, the reasons for the operation, in these instances, are, first, the immediate relief of present symptoms arising from the pressure of extravasated fluid; and, secondly, the discharge of matter, formed between the skull and dura mater, in consequence of inflammation. The operation of trephining was also recommended by Pott, as a *preventive* of ill consequences; a practice, however, which is now never adopted by the most eminent surgeons; and many writers of the highest reputation, especially Desault, Dease, Mr. John Bell, and Mr. Abernethy, urgently, and properly remonstrate against the method.

The latter remarks: "In the accounts, which we have of the former practice in France, it is related, that surgeons made numerous perforations along the whole track of a fracture of the cranium; and, as far as I am able to judge, without any clear design. Mr. Pott also advises such an operation, with a view to prevent the inflammation and suppuration of the dura mater, which he so much apprehended. But, many cases have occurred of late, where, even in fractures with depression, the patients have done well without an operation."

Mr. Abernethy next relates several cases of fracture of the cranium with depression, which terminated favourably, although no operation was performed. This judicious surgeon thinks, that these cases, as well as a great many others on record, prove, that a slight degree of pressure does not derange the functions of the brain, for a limited time after its application: and all those patients, whom he had an opportunity of knowing for any length of time after the accident, continued as well as if nothing of the kind had happened to them. In Mr. Hill's cases in surgery, two instances of this sort are related, and Mr. Hill knew both the patients for many years afterwards; yet, no inconvenience arose. Indeed, it is not easy to conceive, that the pressure, which caused no ill effects at a time, when the contents of the cranium filled its cavity completely, should afterwards prove injurious, when they have adapted themselves to its altered size and shape. Severe illness, indeed, does often intervene between the receipt of the injury, and the time of its recovery; and many surgeons might be inclined to attribute this to pressure; but, it equally occurs when the depressed portion is elevated. If a surgeon, prepossessed with the opinion, that elevation of the bone is necessary in every instance of depressed cranium, should have acted upon this opinion in several of the cases, which Mr. Abernethy has related, and afterwards have employed proper evacuations, his patients would probably have had no bad symptoms, and he would naturally have attributed their well-doing to the mode of treatment, which he had pursued: yet, these cases did equally well without an operation. (See *Abernethy on Injuries of the Head.*)

Depressed fractures of the skull not being our immediate consideration, we need not expatiate upon them; but, it seemed right to make the preceding remarks, in order to shew how unnecessary it must be to trephine a patient, merely because there is a fracture of the cranium, and with a view of *preventing* bad consequences. Even when the fracture is depressed, it is not necessary, unless there are evident signs, that the degree of pressure, thus produced on the brain, is the cause of existing bad symptoms.

The inflammation and suppuration of the parts, beneath the skull, which Mr. Pott wished so much to prevent by trephining early, do not arise from the occurrence of a breach in the cranium, but, are the consequences of the same violence, which was the occasion of the fracture. Hence, it is obvious, that removing a portion of the bone cannot in the least prevent the inflammation and suppuration, which must result from the external violence which was first applied to the head; but, on the contrary, such a removal being an additional violence, must have a tendency to increase the inevitable inflammatory mischief.

From what has been said, it is not to be inferred, however, that trephining is never proper, when there is a simple undepressed fracture of the skull. Such injury may be joined with an extravasation of blood on the dura mater; or, it may be followed by the formation of matter between this membrane and the cranium; in both which circumstances, the operation is essential to the preservation of the patient, immediately, but not before, the symptoms indicative of the existence of dangerous pressure on the brain, begin to shew themselves. (See *Trephine.*)

A fracture of the skull, unattended with urgent symptoms, and not brought into the surgeon's view by any accidental wound of the integuments, often remains for ever undiscovered; and as no benefit could arise from laying it bare by an incision, such practice should never be adopted. The surgeon ought only to be officious in this way, when he can accomplish by it some better object, than the merely satisfying his own curiosity. And as we shall find from the perusal of this article, and the one intitled, *Trephine,* that the removal of pressure off the surface of the brain is the only possible reason for ever perforating the cranium with this instrument; and as dividing the scalp is only a useful measure, when it is preparatory to such operation; neither the one, nor the other, should ever be practised, unless there exist unequivocal symptoms, that there is a dangerous degree of pressure operating on the brain, and caused either by matter, extravasated blood, or a depressed portion of the skull.

The true mode of *preventing* the bad effects, frequently following, but not arising from, simple fractures of the skull, is not to trephine, but, to put in practice all kinds of antiphlogistic means. For this purpose, let the patient be repeatedly and copiously bled, both from the arm and temporal arteries; let him be properly purged; give him antimonials; keep him on the lowest diet; let him remain in the most quiet situation possible; and if, notwithstanding such steps, the symptoms of inflammation of the brain continue to increase, let his head be shaved, and a large blister be applied to it. These are the cases, also, in which the topical application of cold water to the head, by means of cloths kept constantly wet, is an eligible, though in this country a much neglected, practice. Numerous instances, however, in favour of the method, are recorded by the celebrated Prussian surgeon Schmucker. (See *his Chirurgische Wahrnehmungen, Ersten Theil, Berlin,* 1774.) When, in spite of all these measures, matter forms under the cranium, attended with symptoms of pressure, a puffy tumour of the injured part of the scalp, or those changes of the wound, if there is one, which Mr. Pott has so excellently described, and we have already related; not a moment should be lost in delaying to perforate the bone with the trephine, and giving vent to the matter beneath.

### 4. *Fractures of the Cranium with Depression.*

"Simple fractures of the skull, or those in which the parts of the broken bone are not depressed from their situation (observes Mr. Pott) differ from what are called fissures, only in the distance of the edges of the breach from each other. When the separation is considerable, it is called a fracture; when it is very fine and small, it is called a fissure. The chirurgical intention, and requisite treatment, are the same in each, viz. to procure a discharge for any fluid which may be extravasated in present, (*here we must understand supposing the pressure of such extravasation produces urgent symptoms*) and to guard against the formation, or confinement of matter. The prevention of suppuration will, as we have already remarked, be best accomplished, not by perforating the cranium, as Mr. Pott advised, but by copious bleeding, evacuations, blisters, and a rigorous antiphlogistic regimen. The confinement of matter, producing symptoms of pressure on the brain, certainly indicates the immediate use of the trephine.

"But, in fractures, attended with depression, (says Pott) the intentions are more. In these the depressed parts are to be elevated, and such as are so separated as to be incapable of reunion, or of being brought to lie properly, and without pressing on the brain, are to be totally removed. These circumstances are peculiar to a depressed fracture; but, although they are peculiar, they must not be considered as sole, but, as additional to those, which have been mentioned at large under the head of simple fracture: commotion, extravasation, inflammation, suppuration, and every ill, which can attend on, or be found in the latter, are to be met with in the former, and will require the same method of treatment." That loose splintered pieces of the cranium, when quite detached, and already in view, in consequence of the scalp being wounded, ought to be taken away, no one will be inclined to question. That they ought also to be exposed by an incision, even when the scalp is unwounded, and then taken away, whenever they cause symptoms of irritation, or pressure, I believe, will be universally allowed. But, the reader will already understand, from what has been said, in the preceding section, that several excellent surgeons do not coincide with Pott, in believing, that every depressed fracture of the skull necessarily demands the application of the trephine.

"There certainly are (says Mr. Abernethy) degrees of this injury, which it would be highly imprudent to treat in this manner. Whenever the patient retains his senses perfectly, I should think it improper to trephine him, unless symptoms arose, that indicated the necessity of it." *P.* 21.

It is extraordinary and unaccountable, but, it is not less true, that no calculation of the bad effects can be made by the degree, in which a part of the skull is depressed. This is a fact, which has been long known. It has also been particularly adverted to by an eminent modern writer. "Various instances also presented themselves, in which, though a considerable degree of compression must have been occasioned, sometimes by the depression of both tables, and at other times by the depression of the inner table only of the skull, yet neither stupor, paralysis, nor loss of memory were produced. In one of these cases, the middle of the right parietal bone was fractured, and considerably depressed by a ball, which was extracted on the twentieth day. In this case, neither stupor, nor paralysis appeared. In another, a musket-ball had struck the right parietal bone, fractured it, and was flattened and lodged between the tables of the skull. The inner table was much depressed, yet no bad symptoms supervened." (See *Thomson's Reports of Observations made in the Military Hospitals in Belgium, p.* 59—60.) The same author also saw a singular case, in which a ball, entering behind the right temple, and passing backwards and downwards, had fractured the bones in its passage, and lodged in the surface of the brain, over the tentorium, from which place it was extracted on the seventeenth day, after the injury. No bad symptom had manifested itself previously to the operation, and the man recovered under the strictest antiphlogistic regimen, with little or no constitutional derangement.

If then the violence of the symptoms is not always in proportion to the compression, but is sometimes considerable when the pressure is slight, every surgeon cannot be too fully impressed with the following truth, that *existing symptoms of dangerous pressure on the brain,* which symptoms will be presently related, *can alone form a true reason for perforating the cranium.* The mode of operating, in order to elevate depressed portions of the skull, is explained in the article, *Trephine.*

### 5. *Extravasation under the Cranium; Symptoms of Pressure on the Brain, &c.*

Mr. Pott remarks, "the shock, which the head sometimes receives by falls from on high, or by strokes from ponderous bodies, does not infrequently cause a breach in some of the vessels, either of the brain, or its meninges; and, thereby, occasions extravasation of the fluid, which should circulate through them. This extravasation may be the only complaint produced by the accident; or it may be joined with, or added to, a fracture of the skull. But this is not all, for it may be produced not only when the cranium is unhurt by the blow, but even when no violence of any kind has been offered to, or received by the head."

When blood is extravasated beneath the skull, the violence which produces the rupture of the vessel, usually stuns the patient, from which state, provided the quantity and pressure of the blood, and the force of the concussion be not too great, he gradually recovers, and regains his senses. If the first extravasation be trivial, the patient, after regaining his senses, may only feel a little drowsiness, and go to bed. The bleeding from the ruptured vessel continuing, and the pressure on the brain increasing, he becomes more and more insensible, and begins to breathe in a slow, interrupted, stertorous manner. In cases of compression, whether from blood or a depressed portion of the skull, there is a general insensibility, the eyes are half open, the pupil dilated, and motionless even when a candle is brought near the eye; the retina is insensible; the limbs relaxed; the breathing stertorous; the pulse slow, and according to Mr. Abernethy, less subject to intermission, than in cases of concussion.

In a case of wound of the posterior part of the skull, with depression, seen by Dr. J. Thomson, the pulse at one time sunk as low as 36 strokes in a minute. This eminent professor, however, is at variance with Mr. Abernethy upon one point, by stating, that irregularity of the pulse is a very frequent attendant upon compressed brain. (*Report of Observations, &c. p.* 54—55.) Sometimes convulsions arose from the pressure of portions of the skull, driven in upon the brain. This is a very dangerous symptom; but, Dr. Thomson saw it cease in a few examples, after the depressed piece of bone had been elevated, and the antiphlogistic regimen adopted. (*P.* 60.)

The patient is hardly ever sick, when the pressure on the brain and the general insensibility, are considerable; for, the very action of vomiting betrays an irritability in the stomach and œsophagus. These symptoms are not peculiar to pressure from blood, but arise also from that of many depressed fractures of the skull, and of suppuration under this part. They are all attributable to the unnatural pressure made on the brain and nerves, and have too often been mistaken, as indications of an injury, which, considered abstractly, can never cause them; we allude to a simple undepressed fracture of the cranium, which may be accompanied with them, but cannot cause them. They differ in degree, according to the quantity, kind, and situation of the pressing fluid. The hemorrhage from the nose and ears, which often follows violence applied to the head, leads to no particular or useful inference: we cannot even calculate, by this sign, that the force has exceeded a certain degree; for, such bleedings take place, in many persons, from much slighter causes than in others.

Paralysis is a symptom, which generally attends hurtful pressure on the brain. The particular circumstances, however, which determine its degree, extent, and situation, are not well understood. "In some instances of the paralysis from sabre-wounds, as well as in those made by gun-shot, (says Dr. J. Thomson) the paralysis was confined to the upper, and in others to the lower extremity. In every instance, in which it distinctly appeared, that the injury existed on one side of the head, the paralysis uniformly manifested itself upon the other; but, we were unable to perceive any other fixed relation, between the part of the brain, which had been injured, and the part of the body affected with palsy. A wound of the right parietal bone by a musket-ball was followed by palsy of the left arm and leg. In another case, a wound, penetrating the upper part of the right parietal bone, was accompanied with a slight paralytic affection of the left side of the mouth, and complete palsy of the left leg. In a third case, a sabre-wound of the same bone, followed by extensive exfoliations, gave rise to a complete palsy of the left side." (*Report of Observations made in the Military Hospitals in Belgium, p.* 52—53.)

The preceding class of symptoms only inform us, that the brain is suffering compression; and leave us quite in the dark, respecting several other very important circumstances. "We not only have no certain infallible rule, whereby to distinguish, what the pressing fluid is, or where it is situated, but we are, in many instances absolutely incapable of knowing, whether the symptoms be occasioned by any fluid at all; for, a fragment of bone, broken off from the internal table of the cranium, and making an equal degree of pressure, will produce exactly the same complaints." (*Pott.*) In detailing the symptoms of pressure from blood, I took particular notice of the patient being at first generally stunned by the blow; of his gradually regaining his senses, and of his afterwards relapsing into a state of insensibility again. *The interval of sense,* which thus occurs, is a circumstance, of the greatest consequence in making the surgeon understand the nature of the case.

"A concussion, and an extravasation (as Mr. Pott observes) are very distinct causes of mischief, though not always very distinguishable.

"M. Le Dran, and others of the modern French writers, have made a very sensible and just distinction between that kind and degree of loss of sense which arises from a mere commotion of the brain, and that which is caused by a mere extravasation, in those instances in which the time of the attack or appearance of such symptoms are different or distinct. The loss of sense, which immediately follows the violence, say they, is most probably owing to a commotion; but that which comes on after an interval of time has past, is most probably caused by extravasation.

"This distinction is certainly just and good, as far as it will go. That degree of abolition or diminution of sense, which immediately attends or follows the blow or fall, and goes off again without the assistance of art, is in all probability occasioned by the sudden shake or temporary derangement of the contents of the head; and the same kind of symptoms recurring again some time after they had ceased, or not coming on until some time has passed from the receipt of the violence, do most probably proceed from the breach of a vessel within or upon the brain. But unluckily, we have it not very often in our power to make this exact distinction. An extravasation is often made so immediately, and so largely, at the instant of the accident, that all sense and motion are instantaneously lost, and never again return. And it also sometimes happens, that although an extravasation may possibly not have been made at the moment of the accident, and the first complaints may have been owing to commotion merely, yet a quantity of fluid having been shed from its proper vessels very soon after the accident, and producing its proper symptoms, before those caused by the commotion have had time to go off, the similarity of the effects of each of these different causes is such, as to deprive us of all power of distinguishing between the one and the other, or of determining with any tolerable precision to which of them such symptoms as remain are really owing.

"When an extravasation of any kind is made, either upon or within the brain, if it be in such quantity, or so situated, as to disorder the œconomy of the animal, it always produces such disorder, by making an unnatural pressure on the parts where it lies. The nature and degree of the symptoms hereby produced are various and different in different persons, according to the kind, quantity, and situation of the pressing fluid. Sometimes it is mere fluid blood, sometimes blood in a state of coagulation, sometimes it is a clear lymph, and at others blood and water are found mixed together; each of these is found either simple or mixed in different situations, that is, between the skull and dura mater, between the dura and pia mater, or in the natural cavities of the brain called its ventricles, and sometimes, in cases of great violence, they are found at the same time in all these different parts. Sometimes a considerable quantity is shed instantly, at the time of the accident; and sometimes the breach by which the effusion is made is so circumstanced, both as to nature and situation, that it is at first very small, and increases by faster or slower degrees. In the former, the symptoms are generally immediate and urgent, and the extravasation is of the bloody kind; in the latter, they are frequently slight at first, appear after some little interval of time, increase gradually till they become urgent or fatal, and are in such case, generally occasioned by extravasated lymph. So that although the immediate appearance of bad symptoms does most certainly imply mischief of some kind or other, yet, on the other hand, no man ought to suppose his patient free from hazard, either because such symptoms do not shew themselves at first, or because they appear to be but slight: those which come on late, or appearing slight at first, increase gradually, being full as much to be dreaded as to consequence, as the more immediately alarming ones; with this material difference between them, that the one *may* be the consequence of a mere concussion of the brain, and may by means of quietude and evacuation go quite off; whereas, the other being most frequently owing to an extravasation of lymph, (though sometimes of blood also) within the substance of the brain, are very seldom removed by art." (*Pott.*)

The case of extravasation, between the cranium and dura mater, is almost the only one, which admits of relief from trephining. Mr. Abernethy informs us, that in the cases, which he has seen, of blood extravasated, between the dura and pia mater, on a division of the former membrane being made for its discharge, only the serous part of it could be evacuated: for, the coagulum was spread over the hemisphere of the brain, and had descended, as low as possible, towards its inferior part, so that very little relief was obtained by the operation. (*P.* 32.)

Fractures of the cranium, which take place across the lower and front angle of the parietal bone, and the rest of ~~the~~ track of the trunk, and large branches of the spinous artery of the dura mater, are cases very apt to be attended with a copious extravasation. This vessel, and others more deeply seated, however, may be ruptured, pour out a considerable quantity of blood, and induce urgent symptoms of pressure on the brain, not only without the co-existence of a fracture, but even of any external mark of violence on the scalp.

The effused blood is, more frequently, situated below the part, on which the violence has operated, and, hence, when such part is pointed out by a wound, or discoloration of the scalp, and the symptoms of pressure are considerable, there cannot be two opinions, respecting the propriety of immediately trephining, and the place, where to make the perforation. But, what is to be done, when dangerous symptoms of pressure prevail, without any external mark to denote, what part of the head received the blow, or whether any at all; for, a general concussion of the head may produce an effusion of blood within the cranium. Under these circumstances, Mr. Pott was against the operation, and says that "the only chance of relief is from phlebotomy, and an open belly; by which we may hope so to lessen the quantity of the circulating fluids as to assist nature in the dissipation or absorption of what has been extravasated. This is an effect which, although not highly improbable in itself, yet is not to be expected from a slight or trifling application of the means proposed The use of them must be proportioned to the hazard of the case. Blood must be drawn off freely and repeatedly, and from different veins; the belly must be kept constantly open, the body quiet, and the strictest regularity of general regimen must be rigidly observed. By these means, very alarming symptoms have now and then been removed, and people in seemingly very hazardous circumstances have been recovered."

I once conceived that, in these almost hopeless desperate cases, it might be proper to perforate the cranium in the course of the spinous artery of the dura mater, as being a place, under which large extravasations often lie. The proposal, however, has been deemed by some too bold, and so much inclined are the world to blame a surgeon, when his exertions are unsuccessful, that, even if the practice were right in principle, it could not often succeed, and therefore would be wrong in policy. No doubt, the effused blood would frequently not be found, the patient die, and some share of his death be ascribed to the operation.

This part of practice, at all events, is exceedingly doubtful and obscure. But, should the mode of judging, whether blood lies immediately under the skull, suggested by Mr. Abernethy, prove invariably correct, our line of conduct may be hereafter more easily determined, respecting whether the trephine should be applied in such dubious cases, or not. Even when the injured scalp shews where the violence has operated, the criterion, we are about to notice, may inform us, whether we should perforate the bone, or not; for, though the extravasation is sometimes found immediately under the external mark, yet, it often is not so; but, is in a part distant from that mark, to which we have nothing to lead us, and to which, indeed, if we knew it, we could not reach. Mr. Abernethy has observed, "that unless one of the large arteries of the dura mater be wounded, the quantity of blood, poured out, will probably be inconsiderable; and the slight compression of the brain, which this occasions, may not be attended with any peculiar symptoms, or perhaps, it may occasion some stupor, or excite an irritation, disposing the subjacent parts to become inflamed. It is indeed highly probable, that, in many cases, which have done well without an operation, such an extravasation has existed. But, if there be so much blood on the dura mater, as materially to derange the functions of the brain, the bone, to a certain extent, will no longer receive blood from within, and by the operation, performed for its exposure, the pericranium must have been separated from its outside. I believe, that *a bone, so circumstanced, will not be found to bleed.*" In some cases, related by this gentleman, there was no hemorrhage; twice he was able, by attending to this circumstance, to tell how far the detachment of the dura mater extended; and often, when symptoms seemed to demand a perforation of the skull, he has seen the operation contra-indicated by the hemorrhage from the bone, and as the event shewed, with accuracy. (*P.* 33.)

Pott justly remarks, that "if the extravasation be of blood, and that blood be in a fluid state, small in quantity, and lying between the skull and dura mater, immediately under or near to the place perforated, it may happily be all disharged by such perforation, and the patient's life may thereby be saved; of which many instances are producible. But if the event does not prove so fortunate, if the extravasation be so large or so situated that the operation proves insufficient, yet the symptoms having been urgent, general evacuation having been used ineffectually, and a wound or bruise of the scalp having pointed out the part which most probably received the blow: although the removal of that part of the scalp should not detect any injury done to the bone, yet the symptoms still subsisting, I cannot help thinking, that perforation of the cranium is in these circumstances so fully warranted, that the omission of it may truly be called a neglect of having done that which might have proved serviceable, and, *rebus sic stantibus*, can do no harm. It is very true, that no man can beforehand tell whether such operation will prove beneficial or not, because he cannot know the precise nature, degree, or situation of the mischief; but, this uncertainty properly considered, is so far from being a dissuasive from the attempt, that it is really a strong incitement to make it; it being fully as impossible to know, that the extravasated fluid does *not* lie between the skull and dura mater, and that under the part stricken, as that it *does*; and if the latter should be the case, and the operation be not performed, one, and most probably the only means of relief, will have been omitted."

When there is no interval of sense, between the blow, and the coming on of perilous symptoms, it is frequently impossible to determine, whether the mischief be owing to the largeness and suddenness of the extravasation, to the violence of the shock, which the brain has received, or to both these causes at once, which, unfortunately, is too often the case. In this latter complication, indeed, trephining will frequently be of no avail, even though it serve for the entire removal of all pressure off the brain; for, the patient cannot recover from the violence of the concussion, and never regains his senses. This is no reason, however, why the chance of the operation doing good should not be taken, when there are evident symptoms of pressure. Let us in these darkened cases, call to mind the sentiments of Pott, who says: "No man, who is at all acquainted with this subject, will ever venture to pronounce or promise success from the use of the trephine, even in the most apparently slight cases; he knows that honestly he cannot; it is enough that it has often been successful where and when every other means have failed. The true and just consideration is this: does the operation of perforating the cranium in such case add at all to that degree of hazard which the patient is in before it is performed? or can he in many instances do well without it? If it does add to the patient's hazard, that is certainly a very good reason for laying it aside, or for using it very cautiously; but, if it does not, and the only objection made to it, is, that it frequently fails of being successful, surely it cannot be right to disuse that, which has often been, not only salutary, but the *causa sine quâ non* of preservation, merely, because it is also often unsuccessful, that is, because it is not infallible."

Mr. Pott thought, that, whenever the dura was detached from the inner surface of the skull by blood, as well as matter, the pericranium covering the outer part of the same bone would generally become detached also, and this spontaneous separation of the latter membrane he very justly regards, as a positive indication for the operation. However, it is very certain, that if, in cases of extravasation, the surgeon were to wait for this criterion, the operation would be done too late, and, therefore, whenever unequivocal symptoms of pressure on the brain exist, trephining should never be delayed. Giving vent to the confined blood "may produce a cure, or it may prove only a temporary relief, according to the different circumstances of different cases. The disappearance, and even the alleviation of the most pressing symptoms is undoubtedly a favourable circumstance, but is not to be depended upon as absolutely portending a good event. Either a bloody, or limpid extravasation may be formed, or forming between the meninges, or upon, or within the brain, and may prove as certainly pernicious in future, as the more external effusion would have done, had it not been discharged; or the dura mater may have been so damaged by the violence of the blow as to inflame and suppurate, and thereby destroy the patient." (*Pott.*)

"If the disease (says the same eminent surgeon) lies between the dura and pia mater, mere perforation of the skull can do nothing; and, therefore, if the symptoms are pressing, there is no remedy but division of the outer of these membranes. The division of the dura mater is an operation, which I have several times seen done by others, and have often done myself; I have seen it, and found it now and then successful; and, from those instances of success, am satisfied of the propriety, and necessity of its being sometimes done." He next states, however, his sentiment, that wounding the dura mater is itself attended with dangerous consequences. Mr. Abernethy's opinion of such operation has already been given.

"Upon the removal of a piece of bone by means of the trephine; if the operation has been performed over the part where the disease is situated, and the extravasation be of the fluid kind, and between the cranium and dura mater; such fluid, whether it be blood, water, or both, is immediately seen, and is partly discharged by such opening; if, on the other hand, the extravasation be of blood in a coagulated or grumous state, it is either loose, or in some degree adherent to the dura mater; if the former of these be the case, it is either totally or partially discharged at the time of, or soon after, the operation, according to the quantity or extent of the mischief; if the latter, the perforation discovers, but does not immediately discharge it. In both instances, the conduct of the surgeon, with regard to repetition of the operation, must be determined by the particular circumstances of each individual case; a large extravasation must necessarily require a more free removal of bone than a small one; not only on account of freedom of discharge, but on account of larger detachment of dura mater; and a grumous or coagulated extravasation requires a still more free use of the instrument, not only because the blood in such state is discharged with difficulty, but because the whole surface of the dura mater so covered is always put under the necessity of suppurating, which suppuration has but one chance of a happy event, and that derivable from the free use of the perforator.

"When the extravasation is not between the cranium and dura mater, but either between the meninges, or in the ventricles of the brain, the appearances are not only different from the preceding state of the case, but from each other.

"When the extravasated fluid lies between the skull and dura mater; as soon as that extravasation is discharged, or the grumous blood has been wiped off, the dura mater appears flaccid, easily yields to or does not resist the impression of a finger, and (the discharge being made) enjoys that kind of motion, that elevation and depression, which our fathers supposed it to have naturally and always, but which is only the consequence of the circulation through the brain, and the artificial removal of the piece of bone. But when the extravasation is situated between the meninges, or on the surface of the brain, the appearance is not the same. In this case, there is no discharge upon removing the bone; and the dura mater, instead of being flaccid and readily obeying the motion of the blood, appears full and turgid, has little or no motion, and pressing hard against the edges of the perforation, rises into a kind of spheroidal form in the hole of the perforated bone. If the extravasation be of the limpid kind, the membrane retains its natural colour; but if it be either purely fluid blood, or blood coagulated, and the subject young, the colour of the membrane is so altered by what lies under it, that the nature of the case is always determinable from this circumstance.

"Be the extravasated fluid what it may, it has no natural outlet; absorption was the only chance the patient had whereby to get rid of it without an operation, and that we must now suppose to have failed; an artificial opening therefore must be made, by the division of the dura mater, and perhaps of the pia also. This operation, under the circumstances and appearances already mentioned, is absolutely necessary, and has been successful; it is performed to give discharge to what cannot be got rid of by any other means, and consists in a division of the membrane or membranes, made in a crucial form with a point of a lancet. The operation in itself is extremely simple and easy, but the patient is thereby put into the state of one whose meninges have been wounded, with only this difference, that the wound made for this purpose is smooth and simple, and inflicted with the least possible violence: whereas an accidental wound of the same parts may be lacerated, contused, and attended with circumstances which must aggravate the evil, and may induce worse consequences." (*Pott.*)

All cases of pressure on the brain are attended with hazard of inflammation of this organ, and membranes. This danger must be averted as much as possible, by the antiphlogistic means, recommended in speaking of fractures of the skull.

### CONCUSSION, OR COMMOTION OF THE BRAIN.

"Very alarming symptoms, followed sometimes by the most fatal consequences, (Pott remarks,) are found to attend great violence offered to the head; and, upon the strictest examination both of the living and the dead, neither fissure, fracture, nor extravasation of any kind can be discovered. The same symptoms, and the same event, are met with, when the head has received no injury at all *ab externo*, but has only been violently shaken; nay, when only the body, or general frame, has seemed to have sustained the whole violence." And the same writer afterwards accurately observes, that "the symptoms attending a concussion are generally in proportion to the degree of violence, which the brain itself has sustained, and which, indeed, is cognizable only by the symptoms. If the concussion be very great, all sense and power of motion are immediately abolished, and death follows soon: but, between this degree, and that slight confusion (or stunning, as it is called) which attends most violences, done to the head, there are many stages." I think Mr. Abernethy has particularly excelled other writers, in his description of the symptoms of concussion, which, he thinks, may be properly divided into three stages.

"The *first* is, that state of insensibility and derangement of the bodily powers, which immediately succeeds the accident. While it lasts, the patient scarcely feels any injury that may be inflicted on him. His breathing is difficult, but in general without stertor; his pulse intermitting, and his extremities cold. But such a state cannot last long; it goes off gradually, and is succeeded by another, which I consider as the *second* stage of concussion. In this, the pulse and respiration become better, and, though not regularly performed, are sufficient to maintain life, and to diffuse warmth over the extreme parts of the body. The feeling of the patient is now so far restored, that he is sensible if his skin be pinched; but he lies stupid, and inattentive to slight external impressions. As the effects of concussion diminish, he becomes capable of replying to questions put to him in a loud tone of voice, especially when they refer to his chief suffering at the time, as pain in the head, &c.; otherwise, he answers incoherently, and as if his attention was occupied by something else. As long as the stupor remains, the inflammation of the brain seems to be moderate; but as the former abates, the latter seldom fails to increase; and this constitutes the *third* stage, which is the most important of the series of effects proceeding from concussion.

"These several stages vary considerably in their degree and duration; but more or less of each will be found to take place in every instance where the brain has been violently shaken. Whether they bear any certain proportion to each other or not, I do not know. Indeed this will depend upon such a variety of circumstances in the constitution, the injury, and the after-treatment, that it must be difficult to determine.

"With regard to the treatment of concussion, it would appear, that in the first stage very little can be done; and perhaps, what little is done, had better be omitted, as the brain and nerves are probably insensible to any stimulants that can be employed. From a loose, and, I think, fallacious analogy between the insensibility in fainting, and that which occurs in concussion, the more powerful stimulants, such as wine, brandy, and volatile alkali, are commonly had recourse to, as soon as the patient can be got to swallow. The same reasoning which led to the employment of these remedies in the *first* stage, in order to recall sensibility, has given a kind of sanction to their repetition in the *second*, with a view to continue and increase it.

"But here the practice becomes more pernicious, and less defensible. The circumstance of the brain having so far recovered its powers, as to carry on the animal functions in a degree sufficient to maintain life, is surely a strong argument that it will continue to do so, without the aid of means which probably tend to exhaust parts already weakened, by the violent action they induce.

"And it seems probable, that these stimulating liquors will aggravate that inflammation which must sooner or later ensue." (*Essay on Injuries of the Head, p.* 59.)

The following passage, extracted from a writer, who has already been of material assistance to us on this subject, cannot be too deeply impressed on the memory of every surgical practitioner.

"To distinguish between an extravasation and a commotion, by the symptoms only, is frequently a very difficult matter, sometimes an impossible one. The similarity of the effects in some cases, and the very small space of time which may intervene between the going off of the one and accession of the other, render this a very nice exercise of the judgment. The first stunning or deprivation of sense, whether total or partial, may be from either, and no man can tell from which; but when these first symptoms have been removed, or have spontaneously disappeared; if such patient is again oppressed with drowsiness, or stupidity, or total or partial loss of sense, it then becomes most probable, that the first complaints were from commotion, and that the latter are from extravasation; and the greater the distance of time between the two, the greater is the probability not only that an extravasation is the cause, but that the extravasation is of the limpid kind, made gradatim, and within the brain.

"Whoever seriously reflects on the nature of these two causes of evil within the cranium, and considers them as liable to frequent combination in the same subject, and at the same time considers, that in many instances no degree of information can be obtained from the only person capable of giving it (the patient), will immediately be sensible, how very difficult a part a practitioner has to act in many of these cases, and how very unjust it must be to call that ignorance, which is only a just diffidence arising from the obscurity of the subject, and the impossibility of attaining materials to form a clear judgment.

"When there is no reason to apprehend any other injury, and commotion seems to be the sole disease, plentiful evacuation by phlebotomy and lenient cathartics, a dark room, the most perfect quietude, and a very low regimen, are the only means in our power; and are sometimes successful." (*Pott.*)

The reader, who wishes to acquire the most accurate information, concerning injuries of the head, may consult, with advantage, various dissertations in the *Mem. de l'Acad. de Chirurgie; Traité des Operations de Chirurgie par Le Dran; Dease on Wounds of the Head; Pott on Injuries of the Head from External Violence; Hill's Cases in Surgery; O'Halloran on the different Disorders arising from External Injuries of the Head; Some Cases in Desault's Parisian Chirurgical Journal; Mémoire sur les Plaies de Tête, in Œuvres Chirurgicales de Desault, par Bichat, Tom.* 2; *Lassus, Pathologie Chirurgicale, Tom.* 2, *p.* 252, *&c. Edit.* 1809. *Schmucker's Wahrnehmungen, vol.* 1. *Richerand's Nosographie Chirurgicale, T.* 2, *p.* 230 *et seq. Edit.* 4. *Dr. J. Thomson's Report of Observations made in the military hospitals in Belgium; Edinb.* 1816.

**HECTIC FEVER.** (See *Fevers, Surgical.*)

**HEMERALOPIA.** According to M. Dujardin, this term is derived from ἡμέρα, the day, ἀλως, blind, and ὤψ, the eye, and its right signification is therefore inferred to be *diurna cæcitudo*, or *day blindness.* (See *Journal de Médecine, Tom.* 19, *p.* 348.) In the same sense, Dr. Hillary (*Obs. on the Diseases of Barbadoes, p.* 298, *Edit.* 2.), and Dr.

Heberden (*Med. Transactions, Vol.* 1, *Art.* 5.) have employed the term.

*Hemeralopia* then, which is of very rare occurrence, stands in opposition to the *nyctalopia*, of the ancients, or *night-blindness.* Modern writers in general, however, have used these terms in the contrary sense; considering the hemeralopia, as denoting sight during the day, and blindness in the night, and nyctalopia, as expressing night-seeing, owl-sight, as the French call it, and blindness during the day-time.

Hemeralopia, in the meaning of day-blindness, is a very uncommon affection. Dr. Hillary had never met with but two examples. He mentions a report, however, that there are a people in Siam, in the East Indies, and also in Africa, who are subject to the disease of being blind in the day-time, and seeing well by night. (*Mod. Univ. Hist. Vol.* 7.)

Sauvages affirms, that the hemeralopia, in his nomenclature called amblyopia crepuscularis, had, about two years before, been in some degree epidemic in the neighbourhood of Montpellier, in the villages, in damp situations adjoining the rivers, and that it particularly affected the soldiers, who slept in the open damp air. They were cured, he says, by blistering, together with emetics and cathartics, and other evacuants. (*Nosol. Method. Class* 6, *Gen* 3, *Spec* 1.)

See some ingenious observations on this subject in *Dr. Rees's Cyclopædia, Art. Hemeralopia,* and by Mr. Bampfield in *Medico-Chirurgical Trans. Vol.* 5, *p.* 34, *&c.*

Scarpa, with the generality of modern writers, has considered the hemeralopia, as an affection, in which the patient sees very well in the day, but, not in the night-time.

The abolition of eye-sight by night (observes Mr. Bampfield) has occurred in all ages, and is a common disease of seamen in the East and West Indies, Mediterranean, and in all hot and tropical countries and latitudes, and affects more or less the natives likewise of those regions of the globe. It also occurs frequently among soldiers in the East and West Indies; but, he has been informed, that it is by no means so prevalent amongst them as sailors. It is not an uncommon complaint of the Lascars, employed in the East India Company's ships, trading between India and Europe. It has very rarely indeed affected the officers of His Majesty's, or of the East India Company's ships. Celsus has remarked, that women and virgins, whose menstrual returns are regular, are exempt from this disease (*lib.* 6, *cap.* 6), and it may be observed, that the inhabitants of cold latitudes are less subject to hemeralopia in their own climate, than the natives of tropical countries are in theirs; but, more so, when they visit the tropics. (*Medico-Chirurg. Trans. Vol.* 5, *p.* 38.)

" *Hemeralopia*, or *nocturnal blindness*, (says Scarpa) is properly nothing but a kind of imperfect periodical amaurosis, most commonly sympathetic with the stomach. Its paroxysms come on towards the evening, and disappear in the morning. The disease is endemic in some countries, and epidemic, at certain seasons of the year, in others.

" At sunset, objects appear to persons affected with the complaint, as if covered with an ash-coloured veil, which gradually changes into a dense cloud, which intervenes between the eyes, and surrounding objects. Patients with hemeralopia have the pupil, both in the day and night-time, more dilated, and less moveable, than it usually is in healthy eyes. The majority of them, however, have the pupil more or less moveable in the day-time, and always expanded and motionless at night. When brought into a room faintly lighted by a candle, where all the by-standers can see tolerably well, they cannot discern at all, or in a very feeble manner, scarcely any one object; or they only find themselves able to distinguish light from darkness; and at moon-light their sight is still worse. At day-break they recover their sight, which continues perfect all the rest of the day, till sunset." (*Cap.* 19, *p.* 322, *Edit. 8vo.*)

According to Mr. Bampfield, the disease always affects both eyes at the same time. " In general, (says this gentleman) the nocturnal blindness is at first partial, the patient is enabled to see objects a short time after sunset, and perhaps will be able to see a little by clear moon-light. At this period of the complaint, he is capable of seeing distinctly by bright candle-light. The nocturnal sight, however, becomes daily more impaired and imperfect, and after a few days, the patient is unable to discriminate the largest objects after sunset, or by moon-light, &c. and, finally, after a longer lapse of time, he cannot perceive any object distinctly by the brightest candle-light. If the patient is permitted to remain in this state of disease, the sight will become weak by day-light, the rays of the sun will be too powerful to be endured, whether they are direct, or reflected; lippitude is sometimes induced; myopism, or shortness of sight succeeds; and in progress of time, vision becomes so impaired and imperfect, that apprehensions of a total loss of sight are entertained; and this dreadful consequence has been known to ensue, where the complaint has been totally neglected, or left to nature, or where ineffectual remedies have been employed. (*Bontius, p.* 73.)

" It has been remarked by some, that the patients are capable of seeing distinctly, at all periods of the complaint, with the aid of a strong artificial light; but, in *bad* cases of hemeralopia, in my practice, the patients positively denied the existence of the sense of distinct sight by very clear candle-light." (*Bampfield in Medico-Chir. Trans. Vol.* 5, *p.* 39—40.)

The duration of the disease, when left to itself, is generally from two weeks to three, or six months. Experience has not proved, that the disposition to the complaint depends upon any particular colour of the iris, as several writers have conjectured; nor upon the largeness of the eyes, as alleged by Hippocrates. (*Lib.* 6. *sec.* 7.)

In idiopathic cases, the health does not in general suffer, and, except in the worst stage, the eye is not altered in appearance. But, in cases of long duration, the pupil, according to Mr. Bampfield, "is often contracted, and the eyes and actions of the patient evince marks of painful irritation, if the eyes are exposed to a vivid light; or if he looks upward. But, if they meet the direct rays of the sun, which in the tropics are always powerful, or a strong glaring reflection of them, pain and temporary blindness are induced, from which the patient recovers, by closing his eyelids for a time to exclude the rays of light, and retiring to the shade. The pupil of the eye is considerably dilated, both by day and night, in the proportion of about one case in twelve, and at night the pupil is often dilated, and does not perform its expansions and contractions, when exposed to the moon, or artificial light. The cases, attended with dilated pupil, were generally those of long duration, &c.

"Europeans, who have been once affected with hemeralopia, in tropical climates, are particularly liable to a recurrence of this disease, as long as they remain in them." (*Bampfield, op. cit. p.* 42—43.)

The remote causes of idiopathic hemeralopia are not well ascertained. Bontius imputes the complaint to eating hot rice, (*p.* 72—73.) Sleeping with the face exposed to the brilliancy of day-light, the vivid reflection of the sun's rays from the sandy shores of hot countries, and bright moon-light, have been enumerated as causes. Dr. Pye thinks the disorder intermittent. (*Med. Obs. and Enquiries, Vol.* 1, *art.* 13.) But, as Mr. Bampfield properly observes, though the complaint is certainly periodical, there is nothing in its character tending to prove, that it is influenced by the same causes as intermittent fever. The latter gentleman conjectures, "that too much light suddenly transmitted to the retina, or for a long period acting on it, may afterwards render it unsusceptible of being stimulated to action, by the weaker, or smaller quantities of light, transmitted to it by night." (*p.* 44.) Amongst other objections to this explanation, however, it might be remarked, that the patients do not always see, though the light be good; and Mr. Bampfield's own "patients positively denied the existence of distinct sight by very clear candle-light." Besides, if the disease were entirely caused by the sudden, or long operation of vivid light, one would conclude, that all persons subjected to that cause, ought to have the effect produced, which is far from being the case.

When the tongue is white, and the patient has headach and bilious complaints, M. Lassus thinks the cause of the disease is in the stomach and primæ viæ. The same author likewise states, that hemeralopia attacks debilitated persons, subject to catarrhal affections, residing in damp situations, and living on indigestible food. From the combination of such causes, (says he) the disorder was epidemic in the vicinity of Montpellier, (*Sauvage, Nosolog. Method. T.* 2, *p.* 732;) at Belle-Isle sur mer, (*Recueil d'Observ. de Médecine des Hôpitaux militaires, par Richard, T.* 2, *p.* 573;) and hence, it is endemic in watery situations, where the nights are cold and damp. They who expose themselves to this humidity (says M. Lassus), or who navigate along the eastern coasts of Africa, who traverse the Mozambic canal, or sail along the coasts of Malabar and Coromandel, are sometimes attacked by it. (See *Patholôgie Chirurgicale, Tom.* 2, *p.* 542—543.) Hemeralopia sometimes occurs as a symptom of the scurvy. This fact was noticed by Mr. Telford in Sir G. Blane's Treatise on Diseases of Seamen, and it is likewise confirmed by Mr. Bampfield, who remarks, that hemeralopia should be referred to the same causes as scurvy, "when the subject of it has for a long period subsisted on a salted diet at sea, &c. and if any other scorbutic symptom be present, such as spongy gums, ecchymoses, saline smell of the secretions, ulcers with liver-like fungus, &c." (*Medico-Chir. Trans. Vol.* 5, *p.* 45)

This disease (according to Scarpa) may commonly be completely cured, and oftentimes in a very short time, by treating it on the same plan by which the imperfect amaurosis is remedied; (see *Amaurosis*;) viz. by employing emetics, the resolvent powders, and pills, and a blister on the nape of the neck; and topically, the vapours of the caustic volatile alkali: lastly, by prescribing, towards the end of the treatment, bark conjoined with valerian. In cases, in which the disease has been preceded by plethora, and suppressed perspiration, bleeding and sudorifics are also indicated. (*Cap.* 19, *p.* 322—333.)

Scarpa supports this statement by the relation of three cases, in which he cured the disease by such treatment. These patients were all unhealthy, and evidently labouring under disorder of the gastric organs.

One hundred cases, however, of idiopathic, and two hundred of symptomatic hemeralopia, occurred in the practice of Mr. Bampfield, in different parts of the globe, but chiefly in the East Indies. All these cases perfectly recovered: and hence, we may infer, that, under proper treatment, a favourable prognosis may always be given.

Scarpa notices, that the ancients have strongly recommended, for the cure of this disease, the fumigations of a sheep's liver fried. These were directed against the eyes through a funnel; and the liver, thus prepared, was also directed to be eaten. Even in Italy, according to Scarpa, this remedy in general obtains confidence, not only with the vulgar, but also with surgeons. Some writers add, that it is productive of wonderful success among the Chinese, who are said to be very liable to this complaint. Scarpa says, he has no observation of his own to offer in support of this account; but, the plan had been tried without success in a boy, whom Scarpa cured by emetic and resolvent medicines, and the ammoniacal vapours.

Celsus has stated, that persons who have been for some time affected with amaurosis, have regained their sight on being attacked by a diarrhœa. This seems to Scarpa to be corroborated by the case, related by Doctor Pye. (*Med. Obs. and Inq. Vol.* 1.) A man, forty years of age, says he, had been affected for two months with periodical amaurosis, which, for a certain time, had occurred regularly every evening, but afterwards came on irregularly, at different intervals, with considerable dilatation of the pupil, and such obscuration of sight on the approach of night, that even the light of a candle could not be discerned. The man was seized with a diarrhœa. Doctor Pye ordered him to take, for eight successive days, a potion with the kali præparatum; then he prescribed an electuary, composed of bark, nutmeg, and sirup of orange-peel. The two latter ingredients were added to the bark, on account of the continuance of the diarrhœa. The second day after the electuary had been taken, the diarrhœa increased, and the patient vomited copiously; after which he suddenly recovered his sight, so as to see equally well by day and by night. As the diarrhœa continued, the electuary was omitted, after having been taken two days. A violent fever succeeded the diarrhœa, and, it was remarked that, during the highest stage of the former, the patient became rather deaf, but without losing his sight in the night or day-time. Dr. Pye does not mention what steps were taken to moderate the fever, which proved fatal to the patient. At all events, adds Scarpa, it is a fact, that this spontaneous laxness of the bowels entirely freed the man from an imperfect periodical amaurosis. Scarpa entertains no doubt, that, by looking attentively into the numerous collection of medical observations, one might find in them a great many facts similar to the preceding one, shewing the influence of what he terms morbific gastric stimuli over the organ of sight, and, consequently, the great utility of a spontaneous looseness of the bowels in the cure of the imperfect amaurosis.

But, says Scarpa, even if such examples of the incomplete amaurosis being dissipated in consequence of spontaneous vomiting, or copious evacuations from the bowels, produced entirely by nature, were rare, and noticed by few, we now have so many observations, evincing the successful cure of this disease by means of such evacuations, artificially produced by emetics, and internal resolvents, that no doubt whatever can be entertained, concerning the accuracy of the second part of Celsus's admonition, relative to the present view of the imperfect amaurosis: *et recenti re, et interposito tempore, medicamentis quoque moliri dejectiones, quæ omnem noxiam materiam per inferiora depellant.* Of this Scarpa remarks, we undoubtedly have numerous, satisfactory proofs, in the accurate observations, related by Schmucker and Richter; but our confidence, says Scarpa, in the above method of curing the imperfect and periodical amaurosis, must increase, when we take notice, that the most respectable practitioners of past times, have, in the majority of cases, cured this disease only by means of emetics, and internal resolvents, though, in their writings, they may have imputed the success of the treatment to other causes, or the efficacy of other remedies, which they prescribed conjointly with emetics, and resolvents.

Scarpa, after several valuable remarks on amaurosis in general, refers to the *Mercure de France*, for February, 1756, where there is an account of the cures performed by Fournier, on several subjects, affected with hemeralopia. The first were three soldiers, to whom an emetic was administered, after bleeding them. The next day, as they also complained of a heaviness in their head, and nausea, the bleeding and emetic were repeated. This expedient removed all the above symptoms, and these three soldiers were no longer unable to see in the night-time. Fournier met with equal success, in treating eight other soldiers upon the same plan, who were affected with the same disease, and belonged to the same garrison.

Night-blindness is sometimes congenital and therefore constitutional, and altogether beyond the reach of any curative measure. It is said sometimes to be hereditary, and the writer of the article *Nyctalopia* in Dr. Rees's Cyclopædia was acquainted with an instance, in which it occurred to two children of the same family. A case of congenital nyctalopia, which had continued many years without change, and independently of any disease, is related by Dr. Parham. (See *Med. Obs. and Inquiries, Vol.* 1, *p.* 122, *note.*)

Scarpa notices, that Pellier (*Recueil de Mem. et Obs. sur l'Œil. Obs.* 132.) cured Captain Micetti of an hemeralopia by repeated doses of tartar-emetic, a seton in the nape of the neck, and cooling, aperient beverages. Pellier also assures us, that he has several times cured the recent imperfect amaurosis, by means of small doses of tartar-emetic, and topical aromatic fumigations. (*Observ.* 136—138.)

The method of treatment, which Mr. Bampfield adopted, is certainly quite simple. "A succession of blisters to the temples (says he) of the size of a crown, or half crown piece, applied tolerably close to the external canthus of the eye, has succeeded in every case of idiopathic hemeralopia, which I have seen; &c. The first application of blisters commonly enables the patient to see dimly by candlelight, or perceive objects, without the power of discriminating what they are. In some slight cases, that admitted of easy cure, the first application has succeeded perfectly. The second application of blisters commonly enables the patient to see by candlelight distinctly, perhaps by bright moonlight, and even half an hour after sunset, or the sight is restored for short periods during the night, and is again abolished. The second application very often effects a perfect recovery. The third, fourth, or fifth applications in succession, generally produce a complete recovery, where the first, or second, have failed; but, some few rare instances of very obstinate hemeralopia have required even ten successive blisters to each temple; or, instead of using them in succession, a perpetual vesicatory has been formed on each temple, and maintained, until a cure has been accomplished, an event, which has generally followed in a fortnight." (*Bampfield in Medico-Chir. Trans. Vol.* 5, *p.* 47—48.) In some cases, shades over the eyes were worn during the treatment, and a certain time after the cure. The patients were also often directed to bathe their eyes with cold water two or three times a day.

Mr. Bampfield also knew of instances, in which electricity was successfully employed, as a topical stimulus to the eye. He also informs us, that a spontaneous cure sometimes followed the eruption on boils on the head, or face, or the formation of abscesses on these parts, or in the ears.

Although the blisters will generally effect a cure, there were particular cases, in which Mr. Bampfield administered cathartics, such as calomel and the neutral salts. In these examples, the patient has bilious complaints, indicated by a yellow state of the tongue and skin, headach, and pain about the præcordia; or symptoms of indigestion, white tongue, loss of appetite, pain and flatulence of the stomach, &c.

In the scorbutic hemeralopia, the application of blisters is to be deferred, until the state of the constitution is amended, by giving lemon and lime juice, and fresh animal and vegetable food; because the hemeralopia often gradually ceases, as the scurvy is cured; and before this last event, the blister might produce a scorbutic ulcer. Mr. Bampfield estimates, that about one third of the cases of scorbutic hemeralopia resist the efficacy of the antiscorbutic regimen and medicines; and consequently must ultimately be treated as idiopathic cases.

The frequent recurrence of this disease during the patient's continuance in a tropical, or hot climate, naturally suggests the propriety of recommending him to return to his native climate, by which change the tendency to a relapse is in general completely removed. (*Bampfield, in Medico-Chir. Trans. Vol.* 5, *p.* 53.)

Consult *Celsus de re Medica, Cap.* 6. *lib.* 6. *Galeni Op. Lib. de Oculis part* 4. *cap.* 11. 22. *Ætii Sermo Septimus cap.* 48-52-46. *Paul. Æginæ. Lib.* 3. *cap.* 48. *Actuarius, De Method. med. lib.* 4, *cap.* 11. *Rhasis, De Ægritud. Ocul. cap.* 4. *Avicenna, Lib.* 3, *fen.* 3, *tractat.* 4. *Fabricii Hildani, Centur.* 1, *Obs.* 24; *centur.* 5, *obs.* 13. *Platner, Praxis, Med. Journal de Medecine et de Chirurgie ann.* 1756, *T.* 4. *Medical Observations and Inquiries, Vol.* 1. *Recueil d' Observations de Medecine des hopitaux militaires, par Richard, T.* 2. *Duport, Mémoire sur la Goutte Sereine Nocturne épidemique, ou Nyctalopie. Observations on Tropical Nyctalopia by Mr. J. Forbes, in Edinb. Medical and Surgical Journal, No.* 28, *p.* 417 *& seq. Richter's Anfangsgrunde der Wundarzneykunst, Band* 3, *p.* 483 *et seq. Schmucker's Chirurgische Schriften, Band* 2. *Saggio di Osservazioni e D Esperienze Sulle Principali Malattie degli Occhi di Antonio Scarpa, p.* 322 *& seq. Edit.* 8*vo. Venezia* 1802. *Lassus, Pathologie Chirurgicale, T.* 2, *p.* 539, *Edit.* 2. *Rees's Cyclopædia, art. Nyctalopia. A Practical Essay, on Hemeralopia, or Night-blindness, commonly called Nyctalopia, by R. W. Bampfield, in Medico-Chirurgical Trans. Vol.* 5, *p.* 32 *et seq.*

**HEMIOPIA.** (from ἡμισυς, half, and ωψ, the eye.) A certain disorder of the eye, in which the patient cannot see the whole of any object, which he is looking at, but only a part of it. Sometimes, he sees the middle, but not the circumference; sometimes the circumference, but not the centre; while, on other occasions, it is only the upper, or lower half, which is discerned. Sometimes objects are seen thus imperfectly, whether distant, or near; sometimes, only when they are near, and not at a great distance.

The causes of hemiopia are divided by Richter into four kinds.

To the first belong opacities of the cornea and crystalline lens, especially, such as destroy the transparency of only a certain portion of these parts.

The cure of this species of hemiopia depends upon the removal of the partial opacity from which it originates. (See *Cataract*, and *Cornea, Opacities of.*)

Under certain circumstances, persons, whose upper eyelid cannot be properly raised, are affected with hemiopia. They can only discern the lower half of an object, which is near and of large size, unless they go farther from it, draw their heads backward, or turn their eyes downward. The pupil, in particular instances, becomes drawn away from the middle of the iris. This may also be a cause of hemiopia: it is a case, that does not admit of a cure. The affection may likewise proceed from a separation of the iris from the margin of the cornea by external violence, or other causes. Here the cure is equally impracticable.

The foregoing species of hemiopia are merely effects of other diseases. The fourth and last kind is the most important, being generally regarded as an independent disorder. Sometimes, it appears rather to be the effect of a sudden and transient irritation, producing a morbid sensibility in the optic nerve.

The causes of this sort of case, if we can credit Richter, are mostly seated in the abdominal viscera. When the affection is more durable, forming what has been termed *amaurosis dimidiata*, the same treatment is indicated, as in the paralytic affections of the retina and optic nerve, in which last disorders, indeed, it often terminates. (See *Richter's Anfangsgrunde der Wundarzn. Band.* 3, *Kap.* 17.)

**HEMORRHAGE.** (from *αἷμα*, blood, and *ῥηγνυμι*, to break out.) *Bleeding.*

This is doubtless one of the most important subjects in Surgery. The fear of hemorrhage in fact retarded the improvement of our profession for ages: for the ancients, ignorant how to stop bleeding, were afraid to cut out the most trivial tumour, or they did so with terror. They generally performed operations slowly and imperfectly, by means of burning-irons, or ligatures, which the moderns execute quickly and safely with a knife. If the old surgeons ventured to amputate a limb, they only did so, when it had mortified, by dividing the dead parts, and so great was their apprehension of bleeding, that they only dared to cut parts which could no longer bleed. (*John Bell's Principles of Surgery, Vol.* 1. *p.* 142.) But, not only as a consequence of surgery, is hemorrhage to be feared; it is also one of the most alarming accidents, which surgery is called upon to relieve. "*Un sentiment naturel attache à l'idée de perdre son sang; un terreur machinale, dont l'enfant, qui commence à parler, et l'homme le plus décidé, sont également susceptibles. On ne peut point dire, que cette peur soit chimérique. Si l'on comptoit ceux, qui perdent la vie dans une bataille, on verroit, que les trois quarts ont péri par quelque hemorrhagie; et dans les grandes opérations de chirurgie cet accident est presque toujours le plus formidable.*" (*Morand. Mem. de l'Acad. Royale de Chirurgie, Vol.* 5 *8vo.* See *Jones on Hemorrhage.*)

As the blood circulates in the arteries with much greater impetus and rapidity, than in the veins, it necessarily follows, that their wounds are generally attended with much more hemorrhage, than those of the latter vessels, and that such hemorrhage is more difficult to suppress. However, as the blood also flows through veins, of great magnitude, with great velocity, bleedings from them are frequently highly dangerous, and sometimes unavoidably fatal. When an artery is wounded, the blood is of a bright scarlet colour, and gushes from the vessel *per saltum*, in a very rapid manner. The blood issues from a vein in an even, unbroken stream, and is of a dark purple red colour. It is of great practical use to remember these distinguishing differences, between arterial and venous hemorrhage, because, though the oozing of blood may be in both cases equal in quantity, yet, in the latter instance, the surgeon is often justified in bringing the sides of a wound together, without taking farther means to suppress the bleeding, while it would not be proper to adopt the same conduct, were there an equal oozing of arterial blood.

Dr. Jones has favoured the world with a matchless work, on the present subject; and as one grand object of this Dictionary is to convey a careful account of all the latest improvements in surgical science, I shall first endeavour to make the reader acquainted with the more accurate ideas, which this gentleman has lately published, relative to the doctrines of hemorrhage. Afterwards, we shall consider the surgical means to be practised in different cases.

The sides of the arteries are divisible

into three coats. The *internal one* is extremely thin, and smooth. It is elastic, and firm, (considering its delicate structure) in the longitudinal direction, *but so weak in the circular as to be very easily torn by the slightest force applied in that direction.* Its diseases shew, that it is vascular, and it is also probably sensible.

The *middle coat* is the thickest, and is composed of muscular fibres, all arranged in a circular manner; they differ, however, from common muscular fibres in being more elastic, by which they alone keep a dead artery open, and of a cylindrical form. As this middle coat has no longitudinal fibres, *the circular fibres are held together by a slender connexion, which yields readily to any force, applied in the circumference of the artery.*

The external coat is remarkable for its whiteness, density, and great elasticity. *When an artery is surrounded with a tight ligature, its middle and internal coats are as completely divided by it, as they could be by a knife, while the external coat remains entire.*

Besides these proper coats, all the arteries, in their natural situations, are connected, by means of fine cellular substance, with surrounding membranous sheaths. *If an artery be divided, the divided parts, owing to their elasticity, recede from each other, and the length of the cellular substances, connecting the artery with the sheath, admits of its retracting a certain way within the sheath.*

Another important fact is: *that when an artery is divided, its truncated extremities contract in a greater, or less, degree, and the contraction is generally, if not always, permanent.*

Arteries are furnished with arteries, veins, absorbents, and nerves; *a structure, which makes them susceptible of every change to which living parts are subjected in common; enables them to inflame, when injured, and to pour out coagulating lymph, by which the injury is repaired, or the tube permanently closed.* (See Jones on Hemorrhage.)

M. Petit, the surgeon, was the first, who, in 1731, endeavoured to explain the means, which nature employs for the suppression of hemorrhage. He thought, that bleeding from a divided artery is stopped by the formation of a coagulum of blood, which is situated partly *within*, and partly *without* the vessel. The clot, he says, afterwards adheres to the inside of the artery, to its orifice, and to the surrounding parts; and, he adds, that when hemorrhage is stopped by a ligature, a coagulum is formed above the ligature, which only differs in shape, from the one, which takes place when no ligature is employed. His opinion leads him to recommend compression to support the coagulum.

In 1736, M. Morand published additional interesting remarks. He allowed, that a coagulum had some effect in stopping hemorrhage; but, contended, that a corrugation, or plaiting, of the circular fibres of the artery which diminish its canal, and a shortening and consequent thickening of its **longitudinal ones*, which nearly rendered it impervious, had some share in the process. He thought that the cavity of an artery might be obliterated, by the puckering, or corrugation, when *circular pressure, as that of a ligature, is made.*

Morand erred chiefly in explanation; for, the *contraction* and *retraction* of divided arteries are indisputable facts, and, as Dr. Jones remarks, this does not affect the truth of his general conclusion, *that the change, produced on a divided artery, contributes with the coagulum to stop the flow of blood.*

Mr. Samuel Sharp (*2d Edit. of Operations of Surgery*, 1739,) supported the same doctrine. "The blood-vessels, immediately upon their division, bleed freely and continue bleeding, till they are either stopped by art, or at length contracting, and withdrawing themselves into the wound, their extremities are shut up by coagulated blood."

Pouteau (*Mélanges de Chirurgie*, 1760,) denied, that a coagulum is always found after an artery is divided; and, when it is, he thought it only a feeble and subsidiary means towards the suppression of hemorrhage. He contended, that the retraction of the artery had not been demonstrated, and could not be more effectual, than a coagulum. His theory was, that the swelling of the cellular membrane, at the circumference of the cut extremity of the artery, forms the principal impediment to the flow of blood; and that a ligature is useful in promoting a more immediate and extensive induration of the cellular substance.

Gooch, White, Aikin, and Kirkland, all oppose Petit's doctrine of coagulum. The first blends some of Pouteau's theory with his own, by observing, that "when a small artery is totally divided, its retraction may bring it under the surrounding parts, and with the natural contraction of the diameter of its mouth, assisted by the compressive power of those parts, increased by their growing tumid, the efflux of blood may be stopped."

White was convinced, from what Gooch had suggested, and Kirkland confirmed, that the arteries, by their natural contraction, coalesce, as far as their first ramification.

Dr. Jones admits, that an artery contracts after it has been divided, and his experiments authorize him to say, that the contraction of an artery is an important means, but, certainly not the only, nor even the chief means, by which hemorrhage is stopped. The impetuous flowing of the blood through the wound of the artery would resist the contraction of the vessel in such a degree, that would, in almost every instance, be attended with fatal consequences, when the artery is above a certain size, were it not for the formation of a coagulum. (*Jones.*)

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* *Anatomists do not acknowledge that such exist.*

Mr. J. Bell thinks, that when hemorrhage stops of its own accord, it is neither from the retraction of an artery, nor the constriction of its fibres, nor the formation of clots, but, by the cellular substance, which surrounds the artery, being injected with blood.

We must refer the reader to Dr. Jones's work for a complete exposure of the inconsistencies and absurdities in Mr. Bell's account of his own theory. (See *P.* 25, *&c.*)

Dr. Jones very accurately concludes his criticisms on Mr. Bell with observing, that if this gentleman really means to confine his doctrine of the natural means of suppressing hemorrhage to the injection of the cellular substance, round the artery, with blood, he dwells improperly on one of the attendant circumstances to the exclusion of the retraction, and contraction of an artery, and the formation of a distinct clot, all primary parts of the process.

The blood, besides filling the cellular substance round the artery, also fills the cellular substance at the mouth of the artery in a particular manner; for, the divided vessel, by its retraction within its cellular sheath, leaves a space of a determinate form, which, when all the circumstances necessary for the suppression of hemorrhage operate, is gradually filled up by a distinct clot. (*Jones.*)

### MEANS OF NATURE IN STOPPING BLEEDING FROM DIVIDED ARTERIES.

Dr. Jones has given a faithful and accurate detail of a series of experiments on animals, which demonstrate "that the blood, the action, and even the structure of the arteries, their sheath, and the cellular substance connecting them with it," are concerned in stopping bleeding from a divided artery of moderate size, in the following manner: "An impetuous flow of blood, a sudden and forcible retraction of the artery within its sheath, and a slight contraction of its extremity, are the immediate, and almost simultaneous, effects of its division. The natural impulse, however, with which the blood is driven on, in some measure counteracts the retraction, and resists the contraction of the artery. The blood is effused into the cellular substance, between the artery and its sheath, and passing through that canal of the sheath, which had been formed by the retraction of the artery, flows freely externally, or is extravasated into the surrounding cellular membrane, in proportion to the open, or confined state of the wound. The retracting artery leaves the internal surface of the sheath uneven, by lacerating, or stretching the cellular fibres, that connected them. These fibres entangle the blood, as it flows, and thus the foundation is laid for the formation of a coagulum at the mouth of the artery, and which appears to be completed by the blood, as it passes through this canal of the sheath, gradually adhering and coagulating, around its internal surface, till it completely fills it up from the circumference to the centre." (*Jones, p.* 53.)

The effusion of blood into the surrounding cellular membrane, and between the artery and its sheath; but, in particular, the diminished force of the circulation from loss of blood, and a speedy coagulation of this fluid in this circumstance, most essentially contribute, says Dr. Jones, to the desirable effect.

It appears then, that a coagulum, which Dr. Jones calls the *external* one, at the mouth of the artery, and within its sheath, forms the first complete obstacle to the continuance of bleeding, and though it seems externally like a continuation of the artery, yet, on slitting open this vessel, its termination can be plainly observed, with the coagulum shutting up its mouth, and contained in its sheath.

No collateral branch being very near the impervious mouth of the artery, the blood just within it is at rest, and usually forms a slender conical coagulum, which neither fills up the canal of the artery, nor adheres to its sides, except by a small portion of the circumference of its base, near the extremity of the vessel. This coagulum is distinct from the former, and what Dr. Jones calls the *internal* one.

The cut end of the artery next inflames, and the vasa vasorum pour out lymph, which fills up the extremity of the artery, is situated between the internal and external coagula, and is somewhat intermingled with them, or adheres to them, and is firmly united all round to the internal coat of the vessel. Dr. Jones further states, that the permanent suppression of the hemorrhage chiefly depends on this coagulum of lymph; but, that the end of the artery is also secured by a gradual contraction, which it undergoes, and by an effusion of lymph between its tunics, and into the surrounding cellular substance; whereby these parts become thickened, and so incorporated with each other, that one cannot be discerned from the other. Should the wound in the integuments not heal by the first intention, the coagulating lymph, soon effused, attaches the artery firmly to the subjacent and lateral parts, gives it a new covering, and entirely excludes it from the outward wound.

The same circumstances are also remarkable in the portion of the vessel, most remote from the heart. Its orifice, however, is usually more contracted, and its external coagulum smaller, than the one, which attaches itself to the other cut end of the artery (*Jones on Hemorrhage, p.* 56.)

The impervious extremity of the artery, no longer allowing blood to circulate through it, the portion, which lies between it and the first lateral branch gradually contracts, till its cavity is completely obliterated, and its tunics assume a ligamentous appearance. The external coagulum, which in the first instance, had stopped the hemorrhage, is absorbed in a few days, and the coagulating lymph, effused around it, and by which the parts were thickened, is gradually removed, so that they resume again their cellular texture.

At a still later period, the ligamentous portion is reduced to a filamentous state, so that the artery is, as it were, completely annihilated from its cut end to the first lateral branch. Long, however, ere this final change is accomplished, the inosculating branches have become considerably enlarged, so as to establish a free communication, between the disunited parts of the main artery.

When an artery has been divided *at some distance from a lateral branch,* three coagula are formed: one of blood externally, which shuts up its mouth; one of lymph, just within the extremity of its canal; and one of blood, within its cavity, and contiguous to that of lymph. But, when the artery has been divided near a lateral branch, no internal coagulum of blood is formed. (*Jones, p.* 63.)

The external coagulum is always formed, when the divided artery is left to nature; not so, however, if art interferes, for under the application of the ligature it can never form. If agaric, lycoperdon, or sponge, be used, its formation is doubtful, depending entirely upon the degree of pressure, that is used; but, the internal coagulum of blood will be equally formed, whether the treatment be left to art, or nature, if no collateral branch is near the truncated extremity of the artery; and lastly, effused lymph, which, when in sufficient quantity, forms a distinct coagulum, just at the mouth of the artery, will be always found, if the hemorrhage is permanently suppressed. (*Jones, p* 74.)

### MEANS WHICH NATURE EMPLOYS FOR SUPPRESSING THE HEMORRHAGE FROM PUNCTURED, OR PARTIALLY DIVIDED ARTERIES.

The suppression of hemorrhage by the natural means is much more easily accomplished, when an artery is completely divided, than when merely punctured, or partially divided. Completely dividing a wounded artery was one means practised by the ancients in order to stop hemorrhage: the moderns frequently do the same thing, when bleeding from the temporal artery proves troublesome.

Dr. Jones has related many experiments, highly worthy of perusal, and which were undertaken to investigate the present part of the subject of hemorrhage. This gentleman, however, owns, that, in regard to the temporary means by which bleeding from a punctured artery is stopped, he has but little to add to what Petit has explained, in his third publication on hemorrhage. (*Mem. de l'Acad. des Sciences;* 1735.) The blood is effused into the cellular substance, between the artery and its sheath, for some distance, both above and below the wounded part; and when the parts are examined, a short time after the hemorrhage has completely stopped, we find a stratum of coagulated blood between the artery and its sheath, extending from a few inches below the wounded part to two, or three inches above it, and somewhat thicker, or more prominent over the wounded part, than elsewhere.

Hence, rather than say the hemorrhage is stopped by a coagulum, it is more correct to say, that it is stopped by a thick lamina of coagulated blood, which, though somewhat thicker at the wounded part, is perfectly continuous with the coagulated blood lying between the artery and its sheath. (*Jones, p.* 113.)

When an artery is punctured, the hemorrhage, immediately following, by filling up the space, between the artery and its sheath, with blood, and consequently, distending the sheath, alters the relative situation of the puncture in the sheath to that in the artery, so that they are not exactly opposite to each other; and by that means a layer of blood is confined by the sheath over the puncture in the artery, and, by coagulating there, prevents any further effusion of blood.

But, this coagulated blood, like the external coagulum of a divided artery, affords only a temporary barrier to the hemorrhage: its permanent suppression is effected by a process of reparation, or of obliteration.

Dr. Jones's experiments shew, that an artery, if wounded only to a moderate extent, is capable of reuniting and healing so completely, that, after a certain time, the cicatrization cannot be discovered, either on its internal, or external surface; and that even oblique and transverse wounds (which gape most) when they do not open the artery to a greater extent, than one-fourth of its circumference, are also filled up and healed by an effusion of coagulating lymph from their inflamed lips, so as to occasion but little, or no obstruction to the canal of the artery. The utmost magnitude of a wound, which will still allow the continuity of the canal to be preserved, is difficult to be learnt; for, when the wound is large, but yet capable of being united, such a quantity of coagulating lymph is poured out, that the canal of the vessel, at the wounded part, is more or less filled up by it. And when the wound is still larger, the vessel becomes either torn, or ulcerated completely across, soon afterwards, by which its complete division is accomplished.

The lymph which fills up the wound of an artery, is poured out very freely both from the vessel and the surrounding parts, and it accumulates around the artery, particularly, over the wound, where it forms a more distinct tumour. The exposed surrounding parts at the same time inflame, and pour out coagulating lymph, with which the whole surface of the wound becomes covered, and which completely excludes the artery from the external wound. This lymph granulates, and the wound is filled up and healed in the usual manner. (See *Jones on Hemorrhage, p.* 113, *&c.*)

### SURGICAL MEANS OF SUPPRESSING HEMORRHAGE.

It must be plain to every one, who understands the course of the circulation, that pressure, made on that portion of a wounded artery, which adjoins the wound towards the heart, must check the effusion of blood. The current of blood in the veins, running in the opposite direction, requires the pressure to be applied to that side of the wound, which is most remote from the heart. As pressure is the most rational means of impeding hemorrhage, so it is the most effectual; and almost all the plans, employed for this purpose, are only modifications of it. The tourniquet, the ligature, the application of a roller and compresses, even agaric itself, only become useful in the suppression of hemorrhage, on the principle of pressure: the cautery, caustics, and styptics however, have a different mode of operation.

### MEANS EMPLOYED BY THE ANCIENTS.

In order to prevent a wounded person from dying of hemorrhage, Celsus advises the wound to be filled with dry lint, over which is to be laid a sponge dipped in cold water, and pressed on the part with the hand. If, notwithstanding this, he hemorrhage should continue, he reommends repeatedly applying fresh lint, wet with vinegar; but, he is against the use of corroding escharotic applications, on account of the inflammation, which they produce; or only sanctions the employment of the mildest ones. When the hemorrhage resists these methods, *he advises two ligatures to be applied to the wounded part of the vessel, and then to divide the portion situated between them:*—"*Quòd si illa quoque profluvio vincuntur, venæ, quæ sanguinem fundunt, apprehendendæ, circaque id, quod ictum est, duobus locis deligandæ, intercidendæque sunt, ut et in se ipsæ coëant, et nihilominus ora præclusa habeant.*" *Lib.* 5. *cap.* 26. When the ligature is impracticable, he proposes the actual cautery, if the wound should bleed dangerously, and there should be no nerves, nor muscles at the bleeding part.

Galen also mentions tying the vessels to stop the hemorrhage from wounds; and there are some traces of the same information in other authors, who lived before him, as Archigenes, and Rufus. However, it is more than probable, that, in their days, the ligature was little used, as we must infer from the multitude of topical astringents, caustics, and other applications, which they have advised for stopping bleeding, and in which they would have put less confidence, had they been familiarly acquainted with the use of the ligature. No one can doubt, that they would very soon have tied the vessels after amputations, had they had many opportunities of seeing the advantages of the ligature; but, so far were they from adopting such practice, that, Albucasis, a long while afterwards, refused to amputate a wrist, lest he should see his patient bleed to death.

Paré passes for the first, who employed the ligature after amputation. His method having been attacked, he modestly defends it in the part of his works, intitled, *Apologie.* He takes great care to impute the origin of it to the ancients, and cites many of them, who have made mention of it. However, he thinks its utility in amputations of such high consequence, that he considers himself as inspired by the Deity in having first adopted this practice.

The method, in which the ancients placed most confidence, for stopping hemorrhage after the amputation of a limb, was the cauterization of the cut vessel, and part of the surrounding flesh. The parts, thus affected by the heat, formed an eschar, of greater, or less thickness, which blocked up the opening of the vessel, and hindered the blood from escaping. The separation of the eschar, however, which frequently took place too soon, occasioned a return of the hemorrhage, and rendered it the more dangerous, as its suppression became more difficult, than before the cautery was applied. The instrument being too much heated, even, sometimes, immediately brought away with it the eschar, which it had just formed. At the present time, the cautery is never employed, as a means of suppressing hemorrhage, or, at most, only in a few very unusual cases, in which neither compression, nor the ligature can be made use of. In Great Britain, the cautery may be said to be entirely exploded; but, in France, the best hospital surgeons now and then employ it to stop bleedings from the antrum, and the mouth.

It was once a practice to apply pledgets, dipped in boiled turpentine, to the mouths of the bleeding vessels: of this it is only necessary to say, that the method now has long been most justly abandoned.

### ASTRINGENTS, STYPTICS, &c.

Le Dran, in his treatise on the operations of surgery, says, that a button of vitriol, or alum, applied and properly confined on the extremity of the vessel, is sufficient to stop the hemorrhage in amputations. Heister recommends the application of vitriol, in preference to the ligature, in the amputation of the forearm. Great praises have also been conferred on agaric, and sponge, for their styptic properties. Solutions of iron, and all the mineral acids in various forms, have been recommended to the public, as remedies of the same kind, and possessing great efficacy. The ancients, indeed, had already exhausted this class of remedies in such a degree, that the pretended discoveries of the moderns, in this way, may almost all be met with in their writings; and the little success, attending their practice, especially, when bleeding from a considerable artery was to be suppressed, clearly shews what little reliance we ought to place on means of this description. (*Encyclopédie Méthodique; Partie Chirurgicale.*) Styptics do, indeed, possess the power of stopping some hemorrhages from small arteries; but, they ought never to be trusted, when large vessels are concerned.

There is no doubt, that cold air has a styptic property; by which expression I mean, it promotes the contraction of the vessels, for, no styptics can contribute to make the blood coagulate, though such an erroneous idea is not uncommon. We frequently tie, on the surface of a wound, every artery, that betrays the least disposition to bleed, as long as the wound continues exposed to the air. We bring the opposite sides of this wound into contact, and put the patient to bed. Not an hour elapses, before the renewal of hemorrhage necessitates us to remove the dressings. The wound is again exposed to the air, and again the bleeding ceases. This often happens in the scrotum, after the removal of a testicle, and on the chest, after the removal of a breast. The proper conduct, in such cases, is not to open the wound unnecessarily, but, to apply wet linen to the part so as to produce such an evaporation from its surface, as shall create a sufficient degree of cold to stop the bleeding. As all styptics irritate, judicious practitioners seldom apply them to recent wounds. It is sometimes, however, very proper to employ them to suppress hemorrhages from many diseased surfaces, where the vessels seem to have lost their natural disposition to contract.

### COMPRESSION.

We have already remarked, that all the best means of checking hemorrhage, operate on the principle of pressure, the actual and potential cautery, and some styptics excepted; the two first of which act by forming a slough, which stops up the mouths of the vessels; while the latter operate by promoting their contraction. Let us next consider the various modifications of pressure.

M. Petit endeavours to shew, in a dissertation on the manner of stopping hemorrhage, printed in the *Mem. de l'Acad. de Sciences, année* 1731, that the different things which have been praised as infallible specifics, would seldom, or never, have succeeded without compression. It was always requisite, even when caustics were employed, to apply compresses, which were bound on with sufficient tightness to resist the impulse of the blood in the artery, and the premature separation of the eschar, occasioned by the actual or potential cautery. Had this precaution not been taken, there would have been reason to have feared hemorrhage, almost invariably, and which, indeed, did recur but too frequently, when the eschar was detached, notwithstanding the pains taken to avert it by suitable compression. M. Petit has noticed, that the end of the finger, gently compressing the mouth of a vessel, is a sufficient means of stopping hemorrhage from it, and that nothing else would be necessary, if the finger and stump could always be kept in this posture. Hence, he endeavoured to obviate these difficulties by inventing a machine which securely and incessantly executes the office of the finger. This instrument is a double tourniquet, which, when applied, compresses, at once, both the extremity of the divided artery and its trunk above the wound. The compression on the end of the vessel is to be permanent; that on the trunk is only to be made at the time of dressing the wound, or when it is necessary to relax the other. An engraving and particular description of the instrument are to be found in Petit's memoir.

Surgeons used formerly to fill the cavities of wounds with lint, and then make pressure on the bleeding vessels, by applying compresses and a tight roller, over the part. The practitioners of the present day are too well acquainted with the advantages of not allowing any extraneous substance to intervene between the opposite surfaces of a recent wound, to persist in the above plan. They know, that the sides of the wound may be brought into contact, and that compression may yet be adopted, so as both to restrain particular hemorrhages, and rather promote, than retard the union of the wound.

When the blood does not issue from any particular vessel, but from numerous small ones, compression is preferable to the ligature. The employment of the latter would render it necessary to tie the whole surface of the wound. The sides of the wound are to be brought accurately together, and compresses are then to be placed over the part, and a roller to be applied with sufficient tightness to make effectual pressure, but not so forcibly as to produce a danger of the circulation in the limb being completely stopped.

If compression can ever be safely trusted in bleedings from large arteries, it is when these vessels lie immediately over a bone, against which they can be advantageously compressed. Bleedings from the radial and temporal arteries are of this kind. Compression is sometimes tried, when the brachial artery has been wounded in phlebotomy. Here it is occasionally tried, in preference to the ligature, because the latter cannot be employed without an operation to expose the artery.

When there is a small wound in a large artery, the following plan may be tried: a tourniquet is to be applied, so as to command the flow of blood into the vessel. The edges of the external wound are next to be brought into contact. Then, a compress, shaped like a blunt cone, and which is best formed of a series of compresses, gradually increasing in size, is to be placed with its apex exactly on the situation of the wound in the artery. This *graduated compress*, as it is termed, is then to be bound on the part with a roller.

In this manner, I once healed a wound of the superficial palmar arch, in a young lady in Great Pulteney street. The outward wound was very small, and though the hemorrhage was profuse, I conceived, that it might be permanently stopped, if compression could be so made as to keep the external wound incessantly and firmly covered for the space of a day or two. At first, I tried a compress of lint, bound on the part with a roller; but this proving ineffectual, I took some pieces of money, from the size of a farthing to that of a half crown, and, wrapping them up in linen, put the smallest one accurately over the wound, so as completely to cover it. Then the others were arranged, and all of them were firmly confined with a roller, and the arm kept as quiet as possible in a sling. They were taken off after three days, and no hemorrhage ensued.

It is to be observed, that the palmar fascia, in this instance, would prevent the compression from operating on the vessel; but the case shews, that this artery, when wounded, is capable of healing, if the blood be completely prevented from getting out of the external wound by the proper application of compression. Were the outer wound too large to admit of this plan, it would probably be necessary to dissect for the ends of the artery, in order to tie them. This operation, however, is by no means easy; and, perhaps, upon the whole, it might be better to cut down, at once, to the ulnar artery, and put a ligature round it, though this would only certainly stop the bleeding from one end of the vessel in the hand.

Besides compressing the wounded part of the artery, some surgeons also apply a longitudinal compress over the track of the vessel above the wound, with a view of weakening the flow of blood into it. Whatever good effect it may have in this way, is more than counterbalanced by the difficulty which it must create to the circulation in the arm. If the graduated compress be properly arranged, an effusion of blood cannot possibly happen, and pressure along the course of the artery must at all events be unnecessary.

After relaxing the tourniquet, if no blood escape from the artery, the surgeon (supposing it to be the brachial artery wounded) should feel the pulse at the wrist, in order to ascertain, that the compression employed is not so powerful as entirely to impede the circulation in the fore-arm and hand. The arm is to be kept quietly in a sling, and, in forty-eight hours, if no bleeding take place, there will be great reason to expect that the case will do well. In another work, I have given an engraving and description of an instrument, invented by Plenk, for making pressure on the wounded brachial artery, at the bend of the arm, without pressing upon the whole circumference of the limb, and consequently without stopping the circulation. No one, however, would prefer compression when large arteries are injured, except in the kind of cases, to which we have just adverted, or in those in which the wounded vessel can be firmly compressed against a subjacent bone. The compresses sometimes slip off, or the bandages become slack, so that a fatal hemorrhage may arise. Hence, when this method is adopted, the tourniquet should always remain loosely round the limb, ready to be tightened in an instant. Sometimes the external wound heals, while the opening in the artery remains unclosed, and an aneurism is the consequence. This is particularly apt to occur, when the pressure has not been powerful enough; and, when the pressure is too great, mortification is apt to come on: such are the objections to placing much confidence in compression, except when the vessels are not of considerable size.

### TOURNIQUET.

When hemorrhage takes place from a large artery in one of the limbs, where the vessel can be conveniently compressed above the wound in it, a tourniquet, judiciously applied, never fails in putting an immediate stop to the bleeding.

Before the invention of this instrument, which did not take place till the latter part of the 17th century, surgery was really a very defective art. No important operation could be undertaken on the extremities, without placing the patient in the most imminent peril; and the want of the aid, afforded by the tourniquet, made many wounds mortal, which otherwise would not have been attended with the least danger.

As the first invention of this instrument has been claimed by different surgeons, and even different nations, we shall not take upon us to determine where it had its origin. But whoever was the inventor, it was first presented to the public in a form exceedingly simple; so much so, indeed, that it seems extraordinary, that its invention did not happen sooner. A small pad being placed on the principal artery of a limb, a band was applied over it, so as to encircle the limb twice. Then a stick was introduced between the two circles of the band, which was twisted: thus the pad was made to compress with quite power enough completely to stop the flow of blood into the lower part of the vessel.

Although, in the *Armamentarium Chirurgicum* of Scultetus, there is a plate of a machine, invented by this author for compressing the radial artery, by means of a screw, M. Petit is universally allowed to be the first, who brought the tourniquet to perfection, by combining the circular band with a screw, in such a manner that the greatest pressure operates on the principal artery.

The advantages of the modern tourniquet are, that its pressure can be regulated with the utmost exactness; that it operates chiefly on the point where the pad is placed, and where the main artery lies; that it does not require the aid of an assistant to keep it tense; that it completely commands the flow of blood into a limb; that it can be relaxed, or tightened in a moment; and that, when there is reason to fear a sudden renewal of hemorrhage, it can be left slackly round the limb, and, in case of need, tightened in an instant. Its utility, however, is confined to the limbs, and as the pressure necessary to stop the flow of blood through the principal artery, completely prevents the return of blood through the veins, its application cannot be made very long without inducing mortification. It is only of use also in putting a sudden stop to profuse hemorrhages for a time, that is, until the surgeon has put in practice some means, the effect of which is more permanent.

### LIGATURE.

The ancients were quite unacquainted with the use of the tourniquet, and though some of their writers have made mention of the ligature, they do not seem to have known how to make proper use of it, nor to have possessed any other certain means of suppressing hemorrhage from wounds. In modern times, it is easily comprehensible, that when any great operation was undertaken, while surgery was so imperfect, there was more likelihood of harm, than good being done to the patient. Nor can it be wondered at, that the old practitioners should have taken immense pains to invent a great many topical astringents. But now that the ligature is known to be a means which is safe, easy, and much less painful than former methods, we need no longer search for such remedies.

It may, indeed, be set down, as a rule in surgery, that whenever large arteries are wounded, never to trust to any styptic application whatsoever; but to have immediate recourse to the ligature, as being, when properly applied, the most simple and safe of all methods.

In order to qualify the reader to judge of the best mode of applying ligatures to arteries, I shall first explain to him their effect on these vessels, as related by Dr. Jones.

This gentleman learned from Dr. J. Thomson, of Edinburgh, that, in every instance in which a ligature is applied around an artery, without including the surrounding parts, the internal coat of the vessel is torn through by it, and that this fact had been originally noticed by Desault. Dr. Thomson shewed to Dr. Jones, on a portion of artery taken from the human subject, that the internal and middle coats are divided by the ligature. (*Jones, p.* 126.)

This led Dr. Jones to make some experiments on the arteries of dogs and horses, shewing, that when a ligature is applied with sufficient tightness round an artery to cut through its internal and middle coats, although it be immediately afterwards removed, the vessel always becomes permanently impervious at the part which was tied, as far as the first collateral branches above and below the obstructed part. Dr. Jones thinks it reasonable to expect, that the obstruction produced in the arteries of dogs and horses, in the manner he has related, "might be effected by the same treatment in the arteries of the human subject; and, if it should prove successful, it might be employed in some of the most important cases in surgery. The success of the late important improvements which have been introduced in the operation for aneurism, may perhaps appear to most surgeons to have rendered that operation sufficiently simple and safe; but, if it be possible to produce obstruction in the canal of an artery of the human subject, in the abovementioned manner, may it not be advantageously employed in the cure of aneurism; inasmuch as nothing need be done to prevent the immediate union of the external wound?" Dr. Jones next questions, whether this mode of obstructing the passage of blood through the arteries may not also be advantageously practised in cases of bronchocele? (P. 136.)

Subsequent experimentors, as a late writer observes, have not, however, been equally successful with Dr. Jones in obtaining the obliteration of the cavity of the vessel after this operation. Mr. Hodgson tried the experiment in two instances upon the carotid arteries of dogs; and in neither of them was the cavity of the vessel obliterated. The same experiment has been repeated by several surgeons upon the arteries of dogs and horses; but, in no example, as far as Mr. Hodgson knows, has the complete obliteration of the cavity of the vessel been accomplished. "It appears, however, that an effusion of lymph is an invariable consequence of the operation: the want of union is therefore owing to the opposite sides of the vessel not being retained in a state of contact, so as to allow of their adhesion. (See *Observations on the Application of the Ligature to Arteries, &c. by Mr. Travers, Vol.* 4, *Medico-Chirurgical Trans.*) The presence of the ligature, in the common mode of its application, effects this object; and for the success of Dr. Jones's experiment, it appeared only necessary, that the opposite sides of the wounded vessel should be retained in contact, until their adhesion is sufficiently accomplished to resist the passage of the blood through the tube. This object might probably be effected by compression; but, the inconveniences attending such a degree of pressure, as shall retain the opposite sides of an artery in contact at the bottom of a recent wound, are too great to permit its employment. It occurred to Mr. Travers, that if a ligature were applied to an artery, and suffered to remain only a few hours, the adhesion of the wounded surfaces would be sufficiently accomplished to insure the obliteration of the canal; and by the removal of the ligature at this period, the inconveniences attending its stay would be obviated. The danger produced by the residence of a ligature upon an artery, arises from the irritation, which, as a foreign body, it produces in its coats. Ulceration has never been observed to commence in less than twenty-four hours after the application of a ligature; whilst it is an ascertained fact, that lymph is in a favourable state for organization in less than six hours, in a wound the sides of which are preserved in contact. (*Jones, chap.* 4, *exp.* 1.) If it be sufficient, therefore, to ensure their adhesion, that the wounded coats of an artery be kept in contact by a ligature only three or four hours, ulceration and sloughing may in a great degree be obviated by promoting the immediate adhesion of the wound. Justified by this reasoning, Mr. Travers performed several experiments, by which he ascertained that if a ligature be kept six, two, or even one hour upon the carotid artery of a horse, and then removed, the adhesion was sufficiently advanced to effect the permanent obliteration of the canal. It appeared probable, that the same result would be obtained upon the healthy artery of a human subject." (See *Hodgson's Treatise on the Diseases of Arteries and Veins, p.* 228, *et seq*). I shall say little more upon this interesting part of the subject, which we had occasion to notice in a foregoing article, (See *p.* 79—80.), more especially, as it is yet in its infancy, and enough has not hitherto been ascertained to render our confined knowledge of it useful in practice. Mr. A. C. Hutchison, in the year 1800, tied the brachial arteries of two dogs, and removed the ligatures immediately after their application. In both instances, the complete obliteration of the canal of the artery was the consequence of the operation. (See *his Practical Observations in Surgery, p.* 103.) He has also tried this method, as modified by Mr. Travers, in an operation, which he performed for a popliteal aneurism in a sailor, in Nov. 1813. A double ligature was passed under the femoral artery. The ligatures were tied with loops, or slip-knots, about a quarter of an inch of the vessel being left undivided between them. All that now remained of the pulsation in the tumor, was a slight undulatory motion. Nearly six hours having elapsed from the application of the ligatures, the wound was carefully opened, and the ligatures untied and removed, without the slightest disturbance of the vessel. In less than half a minute afterwards, the artery became distended with blood, and the pulsations in the tumor were as strong as they had been before the operation. Mr. Hutchison then applied two fresh ligatures; hemorrhage afterwards came on; amputation was performed, and the patient died. (See *Practical Observations in Surgery*, p. 102, *&c.*) Now, as Dr. Hutchison chose to apply other ligatures, on finding that the pulsation returned, the above case only proves, that the artery is not obliterated in about six hours, and we are left in the dark respecting the grand question, namely, whether the vessel would have become obliterated by the effusion of coagulating lymph and the adhesive inflammation, notwithstanding the return of circulation through it. As for the hemorrhage which occurred, I think it might have been expected, considering the disturbance and irritation, which the artery must have sustained in the proceedings absolutely necessary for the application of not less than four ligatures, and the removal of two of them. According to my ideas, only one ligature ought to have been used, and none of the artery detached. We also have no description of the sort of ligatures which were employed; an essential piece of information in forming a judgment of the merits of the preceding method. The application, removal, and reapplication of ligatures are not consistent with the wise principles inculcated by the late Dr. Jones, and have in more instances than that recorded by Mr. Hutchison, brought on ulceration of the artery and hemorrhage. (See *p.* 80 *of this Dictionary.*)

From Dr. Jones's experiments, it appears, that the first effects of a ligature upon an artery are, a complete division of its internal and middle coats, an apposition of its wounded surfaces, and an obstruction to the circulation of the blood through its canal. There must be a small quantity of stagnant blood, just within the extremity of the artery; but this does not, in every instance, immediately form a coagulum, capable of filling up the canal of the artery. In most cases, only a slender coagulum is formed at first, which gradually becomes larger by successive coagulations of the blood; and hence, the coagulum is always at first of a tapering form, with its base at the extremity of the artery. But, as Dr. Jones remarks, the formation of this coagulum is not material; for soon after the ligature has been applied, the end of the artery inflames, and the wounded internal surface of its canal being kept in close contact by the ligature, adheres, and converts this portion of the artery into an impervious, and, at first, slightly conical sac. It is to the effused lymph that the base of the coagulum adheres, when found to be adherent. Lymph is also effused between the coats of the artery, and among the parts surrounding its extremity. In a little time, the ligature makes the part, on which it is directly applied, ulcerate; and, acting as a tent, a small aperture is formed in the layer of lymph effused over the artery. Through this aperture, a small quantity of pus is discharged, as long as the ligature remains; and, finally, the ligature itself also escapes, and the little cavity, which it has occasioned, granulates and fills up, and the external wound heals, leaving the cellular substance a little beyond the end of the artery, much thickened and indurated. (*Jones, p.* 159, 161.)

In short, when an artery is properly tied, the following are the effects, as enumerated by Dr. Jones:

1. To cut through the internal and middle coats of the artery, and to bring the wounded surfaces into perfect apposition.

2. To occasion a determination of blood to the collateral branches.

3. To allow of the formation of a coagulum of blood just within the artery, provided a collateral branch is not very near the ligature. It merits particular notice, however, that though the nearness of a collateral branch prevents the formation of the coagulum, it cannot always prevent the completion of the adhesive process. In the experiments made on the arteries of horses and dogs by Mr. Travers, the ligature was purposely applied close to large collateral branches, yet the vessels were safely obliterated. (See *Medico-Chirurgical Trans. Vol.* 6, *p.* 658, 660.)

4. To excite inflammation on the internal and middle coats of the artery, by having cut them through, and, consequently, to give rise to an effusion of lymph, by which the wounded surfaces are united, and the canal is rendered impervious; to produce a simultaneous inflammation on the corresponding external surface of the artery, by which it becomes very much thickened with effused lymph; and, at the same time, from the exposure and inevitable wounding of the surrounding parts, to occasion inflammation in them, and an effusion of lymph, which covers the artery, and forms the surface of the wound.

5. To produce ulceration in the part of the artery, around which the ligature is immediately applied, viz. its external coat.

6. To produce indirectly a complete obliteration, not only of the canal of the

artery, but even of the artery itself, to the collateral branches on both sides of the part which has been tied.

7. To give rise to an enlargement of the collateral branches. (*Jones, p.* 163, 164.)

Every part of an artery is organized in a similar manner to the other soft parts, and its coats are susceptible of the same process of adhesion, ulceration, &c. as the other parts are. Hence, the precautions taken to secure the adhesion of other parts, should be observed for the same purpose, with regard to an artery. The vessel is put in a state to admit of adhesion by the ligature, which, when properly applied, cuts through its internal and middle coats, keeps their cut surfaces in contact, and affords them an opportunity of uniting by the adhesive inflammation, as other cut surfaces do. The immediate stoppage of the bleeding is merely the incipient and temporary part of what the ligature has to accomplish; it has also to effect the adhesion of the internal and middle coats of the artery, which being the thing, on which the permanent suppression of hemorrhage depends, is the most important. The size and form of the ligature, whether completely flat, or irregular, have not been, as Dr. Jones remarks, sufficiently attended to; nor is the degree of force employed in tying the artery, often considered. Some surgeons, wishing to guard against the ligature's slipping off, tie it with very considerable force; while others, apprehensive lest they should cut through the artery, or occasion too early a separation of the ligature, draw it only sufficiently tight to prevent the escape of any blood. A broad flat ligature is not likely to make such a wound in the internal and middle coats of the artery, as is most favourable to adhesion, because it is scarcely possible to tie it smoothly round the vessel, which is very likely to be thrown into folds or puckered by it, and consequently, to have an irregular bruised wound made in its middle and internal coats. By covering also a considerable space of the external coat, it may destroy the very vessels which pass on it in their way to the cut surfaces of the inner coats, and thus render them incapable of inflaming. Even supposing the wound to unite, still such a ligature may cover that part of the external coat, which is directly over the newly-united part, and, consequently, as soon as it has produced ulceration through the external coat, it will cause the same effect on the newly-united parts, and, of course, secondary hemorrhage (*Jones, p.*168.)

When a ligature is of an irregular form, it is apt to cut through the internal and middle coats of an artery more completely at some parts than others; but these coats must be perfectly cut through, in order to produce an effusion of lymph from the inside of the vessel, which seems to adhere only at its cut surfaces.

Also, when the ligature is not applied with sufficient tightness, the inner coats of the artery will not be properly cut through. Dr. Jones thinks, that the ligature being sometimes put on so as to deviate from a circle, has a tendency to produce secondary hemorrhage.

Dr. Jones conceives that ligatures are best, when they are round, and very firm, and, he adds, that though a very slight force is necessary to cut through the internal and middle coats of an artery, it is better to tie the vessel more tightly than is necessary merely to cut through its inner coats, because the cut surfaces will thus be more certainly kept in contact; the separation of the ligature expedited; and the danger of ulceration spreading to the newly cicatrized part diminished. The external coat will never ulcerate through, before the inner ones have adhered. The limb, however, should be kept in a perfectly quiet state.

I am sincerely glad to find, that so accurate an observer as Dr. Jones, has refuted the idea, that ligatures occasionally slip off the vessels, in consequence of the violent impulse of the blood. In fact, the blood does not continue to be impelled against the extremity of the artery with the same impetuosity with which it circulated through the vessel before it was tied. The blood is immediately determined into the collateral branches, nor is there any pulsation for some way above the ligature.

Dr. Jones much more rationally imputes this occasional accident, either to the clumsiness of the ligature, which prevents its lying compactly and securely round the artery; or to its not having been applied with sufficient tightness; or to its having that very insecure hold of the vessel, which the deviation from the circular application must occasion. (*P.* 173.)

Dr. Jones is of opinion, that, in cases of aneurism, in which the artery has only been tied with one ligature, and left undivided, and in which secondary hemorrhage has arisen, that this has most probably been owing, either to a diseased state of the artery; to various contrivances for compressing a large portion of the vessel; to having a loose ligature above the one, which is tied; or, lastly, to not tying the artery sufficiently tight to cut through the internal and middle coats, so as to fit them for adhesion, but, so as to cause a gradual ulceration through them, and, of course, bring on hemorrhage, which returns with greater violence, as the ulceration advances. (*P.* 176.)

Dr. Jones seems to consider, that the advantage of the retraction of the *divided* artery within the cellular membrane, is compensated, in the case of the *undivided* artery, by the speedy and profuse effusion of lymph, which takes place over and round the vessel, at the tied part, and even covers the ligature itself. However, he admits the objection, urged by Mr. Abernethy, to using only one ligature, viz. that the vessel cannot be tied, where it lies among its natural connexions, or if tied in this manner either at the upper or lower part of the wound, the hemorrhage will proceed from that part of the vessel, which has the detached portion of the artery for its extremity. This gentleman concludes this point, with allowing it to be *safest and best to apply two ligatures, and to divide the artery between them. P.* 179. *See Aneurism.* Another cause of secondary hemorrhage is the including of other parts in the ligature, together with the artery, by doing which, the division of the inner coats of the vessel may be prevented.

In the valuable publication of Dr. Jones's, to which we have so freely adverted, some secondary hemorrhages are also imputed to the hidden separation, or laceration of the recently united parts of an artery, by premature and extraordinary exertions of the patient. Hence, he strongly insists on keeping a limb, in which a large artery has been tied, perfectly at rest.

Since the article *Aneurism* was printed, some ingenious observations have been published by Mr. Crampton, on the effects of the ligature and compression in obliterating arteries. The purport of his remarks are to prove; 1st. that the obliteration of an artery can *very certainly* be effected, independently of the rupture, or division of any of its coats; 2dly. That this operation of the ligature, so far from being essential to the process, not unfrequently defeats it. (See *Medico-Chir. Trans. Vol.* 7, *p.* 344—345.)

With respect to the first of these assertions, I presume that all practical surgeons have known and admitted it, especially, if the words *very certainly* be left out. Every system of surgery for half a century past has recorded the occasional cure of aneurism by different modes of compression, by which the adhesive inflammation is excited in the artery, or the coagulation of the blood in the aneurismal sac brought about. As, however, the most experienced surgeons have found the method less certain than the use of the ligature, it is not represented by any modern writers, as deserving equal confidence, though there are circumstances, in which simple pressure may be sometimes tried, with a hope of doing away all occasion for an operation. The cases, however, in which compression is applied directly to the artery itself by means of ligatures, with the intervention of other substances, as advised by Scarpa, &c. or by various contrivances, like those of the serre-nœud, the presse-artère, and Assalini's forceps, all require the exposure of the artery, and if commendable, therefore, cannot be so on the principle of saving the patient the pain of an operation, but because they are more effectual than the employment of the ligature. This last point remains to be proved. From the comparatively small number of instances, in which the preceding modes of compression have been practised, I could quote several examples of failure, were it necessary.

With regard to Mr. Crampton's second assertion, that the division of the inner coats of the vessel, so far from being essential to the process of obliteration, not unfrequently defeats it, I think the last part of the observation is altogether unproved. We must admit, that the division of the inner coats is not essential, because arteries sometimes become obliterated under a variety of circumstances, in which such division is not made. But, still, it must be contended, that it renders the process more certain. Mr. Crampton founds his conclusion, that it not unfrequently prevents the obliteration, and gives rise to secondary hemorrhage, upon a few very uncommon cases, in which aneurismal swellings have taken place above the ligature. (See *Warner's Case, p.* 73 *of this Dictionary.*) Here Mr. Crampton presumes, without proof, that the occurrence happened from the division of the inner coats of the artery, though Mr. Warner himself suspected, with more probability, that it proceeded from a diseased state of the vessel. Besides, this event, be it produced in whatever manner it may, is so rare, that I only know of three examples of it on record, and have never known it occur during the last 19 years, that I have been in the constant habit of seeing numerous operations performed. In Mr. Warner's time, such large ligatures were also in use, that it appears to me, they were more likely merely to press the sides of the artery together, like Mr. Crampton's *presse-artère*, than effect a complete division of the inner coats of the vessel, as is accomplished by the small ligatures in modern use.

We shall conclude our remarks on the ligature with a few practical rules.

1. Always tie a large artery, as separately as possible, but still let the ligature be applied to a part of the vessel, which is close to where it lies among its natural connexions.

Besides the reasons for this practice, already specified, we may observe, that including other substances in the ligature causes immense pain, and a larger part of a wound to remain disunited. The ligature is also apt to become loose, as soon as the substance between it and the artery sloughs, or ulcerates. Sometimes the ligature thus applied, forms a circular furrow in the flesh, and remains a tedious time, incapable of separation.

The blood-vessels being organized like other living parts, the healing of a wounded artery can only take place favourably, when that part of the vessel, which is immediately contiguous to the ligature, continues to receive a due supply of blood through its vasa vasorum, which are ramifications of the collateral arteries. Hence, the disadvantage of putting a ligature round the middle of a portion of an artery, which has been separated from its surrounding connexions. Hence, the utility, however, of making the knot, as closely as possible to that part of the vessel which lies undisturbed among the surrounding flesh.

Small arteries neither allow nor require these minute attentions to the mode of tying them.

2. When a divided artery is large, open-mouthed, and quite visible, it is best to take hold of it, and raise its extremity, a little way above the surface of the wound with a pair of forceps. When the vessel is smaller, the tenaculum is the most convenient instrument.

3. While one surgeon holds the vessel in this way, another is to place the noose of a ligature round it, and tie it according to the above directions. In order that the noose may not rise too high, and even above the mouth of the artery, when it is tightened, the ends of the ligature must be drawn as horizontally as possible, which is best done with the thumbs. A knot is next to be made.

4. Ligatures always operating in wounds as extraneous bodies, and one end of each being sufficient for its removal, the other should always be cut off close to the knot, and taken away.

As we have explained in the article *Amputation*, and as we shall notice again in speaking of the *Ligature*, trials have of late years been made of the practice of cutting off both ends of the ligature close to the knot, with a view of diminishing as far as possible the quantity of extraneous substances in the wound. This plan requires the use of very small silk ligatures, in order to be duly judged of. (See *Mr. Lawrence's Obs. in Medico-Chir. Trans. Vol.* 6, *p.* 156, *et seq.*)

5. When a large artery is either partially divided, or completely divided, two ligatures, one to the upper, the other to the lower part of the vessel, are commonly necessary, in consequence of the anastomosing branches conveying the blood very readily into the part of the artery most remote from the heart, as soon as the first ligature has been applied.

6. When a large artery is only punctured, and compression cannot be judiciously tried; if the hemorrhage should continue, the vessel must be first exposed by an incision, and then a double ligature introduced under it, with the aid of an eye-probe. One ligature is to be tied above; the other below the bleeding orifice; with due attention to the principles already advanced.

7. Ligatures usually come away from the largest artery ever tied, in about a fortnight, and from moderate-sized ones in six or seven days. When they continue attached much beyond the usual period, it is proper to draw them very gently every time the wound is dressed, for the purpose of accelerating their detachment. Great care, however, is requisite in doing this; for, as Dr. Jones remarks, as long as the ligature seems firmly attached, pulling it rather strongly must act, more or less, on the recently cicatrized extremity of the artery, which is not only contiguous to it, but is still united to that portion of the artery, (the external coat) which detains the ligature. (*Jones, p.* 162.)

For information concerning hemorrhage, consult *Petit's Mémoirs, among those of l'Acad. des Sciences for the years* 1731, 1732—1735: *Morand sur le Changement, qui arrive aux Artères coupées,* 1736: *Pouteau's Mélanges de Chirurgie: Gooch's Chirurgical Works, Vol.* 1.: *Kirkland's Essay on the Method of suppressing Hemorrhages from divided Arteries: White's Cases in Surgery: J. Bell's Principles of Surgery, Vol.* 1.: *Partie Chirurgicale de l'Encycl. Méth.: Larrey's Mémoires de Chirurgie Militaire, Tom.* 2, *p.* 379. *Pelletan's Clinique Chirurgicale, Tom.* 2, *p.* 240, *&c. Mémoire Elémentaire sur les Hemorrhagies. Richerand's Nosographie Chirurgicale, Tom.* 4. *Sect. sur les Maladies des Artères, p.* 23, *&c. Edit* 4. *Levéillé, Nouvelle Doctrine Chirurgicale, Tom.* 1, *Chap.* 3, *and, particularly, Jones on the Process employed by Nature, in suppressing the Hemorrhage from divided and punctured Arteries,* 1805. *Many useful remarks on the subject of hemorrhage will be found in Hodgson's Treatise on the Diseases of Arteries and Veins. See also Observations upon the Ligature of Arteries, and the causes of secondary Hemorrhage, &c. by B. Travers, in Medico-Chirurgical Trans. Vol.* 4, *p.* 435, *et seq. Likewise further observations on the ligature of arteries by the same, in Medico-Chirurgical Trans. Vol.* 6, *p.* 632, *et seq. Lawrence on a New Method of Tying the Arteries in Aneurism, Amputation, &c. in Vol.* 6 *of the Medico-Chirur. Trans. p.* 156, *&c. and Crampton in Vol.* 7 *of the same work. Dr. J. Thomson's Lectures on Inflammation,*

p. 250, &c. *and his Report of Observations made in the Military Hospitals in Belgium, p.* 42—44.

**HEMORRHOIDS.** (from αἷμα, blood, and ῥεω, to flow.) *Piles.* The etymological meaning of the word is evidently only a discharge of blood. Surgeons, however, sanctioned by long custom, always imply by the term *hemorrhoids,* either a bleeding from the veins of the lower part of the rectum, or else a considerable distention of these vessels, so as to form tumours, but quite unattended with hemorrhage. When the dilated veins do not bleed, the swellings are called *blind piles;* but, when they are attended with occasional discharges of blood, they are named *open piles.* These tumours vary in number, size, form, and situation. Some are *external;* others *internal.* Some are hardly larger than a pea; others exceed a hen's egg in size.

In general, the inconvenience which they occasion, is very supportable; but, sometimes they bring on serious complaints, either by bursting and discharging blood so profusely as dangerously to reduce the patient; or by exciting inflammation of the adjacent parts, and causing abscesses and fistulæ; or, lastly, by becoming strangulated by the contraction of the sphincter ani, so as to occasion very acute pain. Piles, which bleed but little, are not of much consequence; but those which bleed profusely, cause violent pain, or which induce inflammation, and all its effects, demand the greatest attention. Lieutaud makes mention of a person, who lost three quarts of blood from some open piles in the course of a couple of days; and the heretic Arius, and the celebrated philosopher Copernicus are said to have bled to death in this manner.

I do not know what credit ought to be given to the extraordinary case cited by Panaroli, in which a Spaniard is said to have voided every day for four years a pint of blood from some hemorrhoids, without being too much debilitated! (See *Obs. Chirurg. Pentecoste* 2, *Obs.* 46.)

When piles are situated far up in the rectum, they are commonly less painful, than when low down. In the former case, the veins are surrounded by soft and yielding substances, which do not make any painful pressure on the swellings; but, piles, situated towards the anus, are apt to suffer a painful constriction from the action of the sphincter muscle. Hence, when they are very high up in the rectum, the patient has sometimes no warning of his disorder, till he discharges blood from the rectum, and, so violent a bleeding may at once ensue, as to prove fatal.

With regard to the cause of hemorrhoids, any thing capable of retarding the return of blood through the hemorrhoidal veins, may occasion the disease. The pressure of the gravid uterus, costiveness, and the frequent retention of hardened feces in the rectum, are very frequent causes. Persons, who lead sedentary lives, are often troubled with the complaint. From what has been stated, we may easily discern the reason, why women are more subject to piles, than men are, though the disease is so common, that the latter are also very frequently troubled with it.

The pressure of an enlarged liver, or of water accumulated in the cavity of the peritonæum, is said to be sometimes the occasion of piles.

When these tumours are produced by the pressure of the gravid uterus, no cure can be expected till after delivery, when one generally follows spontaneously. Also, when piles are an effect of dropsy, they cannot get well, before the pressure of the fluid in the abdomen has been removed by tapping. Gently laxative medicines, and an horizontal position of the body, commonly alleviate the uneasiness resulting from hemorrhoids. The application of an ointment, composed of equal parts of the powder of oak-galls, and of elder-ointment, or hog's lard, contribute to the same beneficial effect. Applying warm water to the tumours, by means of a bidet, or semicupium, is also frequently productive of great ease. When piles are constricted by the sphincter ani muscle, the pain thus arising may often be at once removed, by pushing the swellings with the finger a little higher up the rectum. Leeches applied to the vicinity of the anus, and puncturing the dilated hemorrhoidal vessels with a lancet, for the purpose of taking away blood, are measures occasionally employed to procure ease. Some practitioners give the preference to leeches; Petit preferred the lancet.

When the number and size of hemorrhoids are so considerable, as materially to obstruct the discharge of the feces; when they are very painful, and subject to profuse bleedings; when the patient is disabled from following his usual occupations; and when all the above means are not of sufficient avail, the surgeon should recommend the removal of the tumours.

Extirpating piles with the actual cautery and caustics, as practised by the old surgeons, is now very properly altogether relinquished by modern practitioners. The only plan ever followed in the present state of surgery, is either to cut the tumours off with a pair of scissars or knife, or to apply a tight ligature round their bases, so as to make them slough away.

When piles are to be cut off, and they are not sufficiently visible, the patient must first strain, as at stool, in order to make the swellings more apparent. With the aid of a pair of dissecting forceps, the skin, covering the hemorrhoids, is then to be separated from them with the knife, but not cut away, and the tumours are to be removed. Sabatier states, that saving the skin is very essential; for, any hemorrhage which may arise, can then be more easily suppressed; and, when there are several hemorrhoids to be extirpated, the loss of substance about the anus will be less, and, of course, the patient will not be so liable to a contraction of this part, which is sometimes a very great affliction.

Mr. Ware thinks it unnecessary to remove all the swellings, when there are several of them. He remarks, that though the number of hemorrhoidal tumours, protruded through the anus, is often considerable, yet the pain is not produced equally by all; but, that the patient will point to one, or at most to two, of the tumours, whence all his pain proceeds. These will be found to be much harder and more inflamed, than the rest; but, generally smaller and less prominent, protruding only just low enough to be compressed by the sphincter muscle.

Hence, Mr. Ware contends, that cutting off the whole number of hemorrhoids with a scalpel, or scissars, and putting a ligature round them, in order to make them die and fall off, are unnecessary. He says, we have only to direct our attention to the hard inflamed tumour, which is the cause of the pain, and which is not unfrequently situated in the centre of the rest. This is often not larger than the end of the little finger, and the removal of it almost instantly abates the pain, and soon makes the rest of the tumours collapse and disappear. Mr. Ware operates as follows: having secured with a common dissecting hook, or forceps, the little hard tumour, which is often in the middle of the rest, and much darker coloured, he snips it off, as close to its basis as possible, with a sharp pair of curved scissars. The pain is trifling, and the hemorrhage so slight, that Mr. Ware says, he has rarely had occasion to use any application to check it. If the hemorrhoids are constantly protruded, the operation may be performed at any time; but, if they only appear after the feces are voided, that opportunity must be taken.

When the pain of hemorrhoids is not violent, but there is a constant distressing uneasiness, with frequent returns of a profuse debilitating hemorrhage, Mr. Ware states, that his method of operating will frequently produce a radical cure.

The excision of piles is occasionally followed by dangerous bleeding, as a case, related by Petit, confirms. A patient had some hemorrhoids, which were supposed to be external, though in fact they were not, being only temporarily protruded. Almost immediately after they had been cut off, the skin which had supported them, was drawn inward. An internal hemorrhage ensued, which could not be suppressed, and proved fatal in less than five hours. The rectum and colon were found full of black, coagulated blood.

After the operation, Mr. Ware advises a thick compress to be applied, wet either with cold brandy and water, or with a cold saturnine lotion, and retained on the part with the T bandage. The patient should be kept quietly in a cooler temperature than usual, and be enjoined to eat and drink nothing of a stimulating quality.

Certainly, if the bleeding should prove troublesome, and proceed from vessels within the rectum, the best plan would be to distend the gut with a suitable piece of sponge, so as to make pressure on the wound, observing to adopt at the same time the means above recommended.

Tying hemorrhoids is free from the danger of hemorrhage; but, still it has its inconveniences, though they are not constant. Petit frequently practised this method, without any ill effects. In other instances, he had reason to repent having adopted it. A woman, for whom he had tied three hemorrhoids with narrow pedicles, which were favourably situated for this operation, did not at first experience a great deal of pain. However, five hours afterwards he was informed, that she suffered violent colic pains, which extended along the colon. The woman was bled four times, without relief. At last, Petit cut the ligatures, which could not be loosened, in consequence of their being concealed so deeply in the substance of the swollen parts. The pain very soon subsided. The ligatures had only been applied four and twenty hours, but the piles had become black, and the skin covering their bases was cut through. Petit removed them, without the least effusion of blood.

M. Petit also relates a case, in which a patient, after having some piles tied, died of symptoms resembling those, which take place in cases of strangulated herniæ, notwithstanding the ligatures were cut as in the foregoing instance. After these two cases, Petit abandoned the plan of curing hemorrhoids by tying them.

I believe, on the whole, that it is best to remove hemorrhoids with a knife, unless they are situated high up the rectum, where the veins are of large size, and likely to bleed profusely. If a tumour so situated should absolutely require removal, a ligature might be put round its base with the aid of a double cannula, in the way we shall relate in speaking of *Polypi*. When the base of the tumour, however, is large, admits of being brought into view, and the surgeon prefers tying it, he should pass a needle, armed with a strong double ligature, through the root of the hemorrhoid, and tie one part of this ligature firmly over one side of the swelling, and the other over the opposite one. When the base of the tumour is narrow, and the ligature is preferred, the part may be tied at once, without passing a double ligature through its middle.

Old hemorrhoids, which have been repeatedly in a state of inflammation, at length acquire a considerable degree of hardness. The internal membrane of the rectum becomes thickened, loses its natural softness, and forms a kind of cyst, which prevents the tumour from bursting and bleeding. (See *Thedens, Progrès de la Chirurgie, Sect.* 4, *p.* 73.) In the end, it ulcerates, and pours out a fetid discharge. Its size cannot now be lessened by the use of emollient applications; and its excision is indispensably necessary. (See *Lassus, Pathologie Chirurg. T.* 1, *p.* 336.)

As piles are seldom fatal, an opinion has commonly prevailed, that they are of a salutary, or critical nature. They have not unfrequently been regarded, as an evacuation, by which some peccant, or morbific matter, is thrown off from the body; and hence, patients have frequently been taught to submit to all the pain, and uneasiness, which the disease occasions, rather than seek a cure. This opinion, however, is neither founded upon impartial and mature observation, nor upon solid reasoning; for, granting that there were any morbific matter in the body, it is impossible to explain why it should be collected in the blood, which fills the dilated veins about the rectum, more than any where else.

For information on hemorrhoids, consult *L'Encyclopédie Méthodique; Partie Chirurgicale. Petit, Œuvres Posthumes, Tom.* 2. *Callisen, Systema Chirurgiæ Hodiernæ, T.* 2, *p.* 105, *Edit.* 1800. *Sabatier, De la Médecine Opératoire, Tom.* 2. *Latta's System of Surgery, Vol.* 2. *Ware on the Treatment of Hemorrhoids. Abernethy on Hemorrhoidal Diseases in his Surgical Works, Vol.* 2, *p.* 231, *&c.*. *Lassus, Pathologie Chirurgicale, T.* 1. *p.* 331, *Edit.* 1809. *Léveillé, Nouvelle Doctrine Chirurgicale, T.* 3, *p.* 164. *Richter Von der Blinden Guldnen Ader in Anfangsgr. der Wundarzneykunst, Band* 6, *p.* 395, *Edit.* 1802.

**HE'RNIA.** (from ερνος, a branch, from its protruding forward.) Surgeons understand by the term *hernia*, a tumour, formed by the protrusion of some of the viscera of the abdomen, out of that cavity, into a kind of sac, composed of the portion of peritoneum, which is pushed before them. However, there are certainly some cases which will not be comprehended in this definition; either because the parts are not protruded at all, or have no hernial sac, as the reader will learn in the course of this article.

### GENERAL REMARKS ON HERNIÆ.

"The brilliant progress, which surgery has made in modern times (says Scarpa) is, properly speaking, only the results of pathological anatomy, that is to say, of exact comparisons of the natural state of our organs with their different diseases, which may depend upon an alteration of texture, a derangement of functions, a solution of continuity, or a change of situation. It is from these important results, that the most rational curative methods, with which modern surgery is enriched, are deduced as so many corollaries; methods, to which we are also indebted for the perfection of operations.

"There are indeed a certain number of surgical operations, for the prompt and safe execution of which, mere anatomical knowledge will suffice; but, in many others, the surgeon cannot promise himself success, even though he be well acquainted with anatomy, unless he has particularly studied the numerous changes of position, and alterations of texture, of which the parts, upon which he is about to operate, are susceptible. If he has not the requisite information upon all these points, false appearances may deceive his judgment, and make him commit mistakes, sometimes of a very serious and irreparable kind.

"In order to have a convincing proof of this truth, it will be sufficient to take a view of the different species of herniæ, and their numerous complications. Assuredly, no anatomist would believe, that the intestine cæcum, naturally fixed in the right ilium, and the urinary bladder, situated at the bottom of the pelvis, could undergo, without being torn, so considerable a displacement as to protrude through the abdominal ring, and descend even into the scrotum; that the same intestine the cæcum could pass from the right iliac region to the umbilicus, so as to protrude at this opening, and form an umbilical hernia; that the right colon could have been seen protruding from the abdomen at the left abdominal ring, and the left colon through the right one; that the liver, the spleen, and ovary could sometimes be the parts contained in the umbilical, inguinal, and femoral herniæ; that the cæcum could engage itself within the colon, and even protrude at the anus; that the stomach, forced through the diaphragm, could form a hernia within the chest; that the omentum, or intestine, or both these parts together, could sometimes make their escape from the belly through the foramen ovale, or sacro-ischiatic notch, of the pelvis; that a noose of small intestine, after being engaged in the abdominal ring, or under the femoral arch, could suffer the most violent strangulation, without the course of the intestinal matter being intercepted; lastly, that, in certain circumstances, the intestine and omentum could be in immediate contact with the testicle, within the tunica vaginalis, without the least laceration of this latter membrane. These and several other analogous facts, says Scarpa, are so surprising, that they would yet be regarded as incredible, had they not been proved by numerous observations on individuals affected with hernia: their possibility (repeats this experienced professor) would not even have been suspected either by the anatomist, or physiologist." (See *Scarpa's Traité des Hernies, Pref.*)

The places, in which these swellings most frequently make their appearance, are the groin, the navel, the labia pudendi, and the upper and forepart of the thigh; they do also occur at every point of the anterior part of the abdomen; and there are several less common instances, in which hernial tumours present themselves at the foramen ovale in the peripæum, in the vagina, at the ischiatic notch, &c. These rarer species of hernia will be noticed in their proper place.

The parts, which, by being thrust forth from the cavity, in which they ought naturally to remain, mostly produce herniæ, are either a portion of the omentum, or a part of the intestinal canal, or both together. But, the stomach, the liver, spleen, uterus, ovaries, bladder, &c. have been known to form the contents of some hernial tumours.

From these two circumstances of situation and contents, are derived all the different appellations, by which herniæ are distinguished. If a portion of intestine only forms the contents of the tumour, it is called *enterocele;* if a piece of omentum only, *epiplocele;* and if both intestine and omentum contribute mutually to the formation of the tumour, it is called *entero-epiplocele.* When the contents of a hernia are protruded at the abdominal ring, but only pass as low as the groin, or labium pudendi, the case receives the name of *bubonocele,* or *inguinal hernia;* when the parts descend into the scrotum, it is called an *oscheocele,* or *scrotal hernia.* The *crural,* or *femoral hernia,* is the name given to that which takes place below Poupart's ligament. When the bowels protrude at the navel, the case is named an *exomphalos,* or *umbilical hernia;* and *ventral* is the epithet given to the swelling, when it occurs at any other promiscuous part of the front of the abdomen. The *congenital rupture* is a very particular case, in which the protruded viscera are not covered with a common hernial sac of peritoneum, but are lodged in the cavity of the tunica vaginalis, in contact with the testicle, and, as must be obvious, it is not named, like herniæ in general, from its situation, or contents, but from the circumstance of its existing from the time of birth.

When the hernial contents lie quietly in the sac, and admit of being readily put back into the abdomen, the case is termed a *reducible hernia;* and, when they suffer no constriction, yet cannot be put back, owing to adhesions, or their large size in relation to the aperture, through which they have to pass, the hernia is termed *irreducible.* An *incarcerated,* or *strangulated hernia,* signifies one, which not only cannot be reduced, but suffers constriction; so that, if a piece of intestine be protruded, the pressure, to which it is subjected, stops the passage of its contents onward towards the anus, makes the bowel inflame, and brings on a train of most alarming, and often fatal consequences.

The causes of herniæ are either *predisposing* or *exciting.* Of the former kind, writers mention a preternaturally large size of the openings, at which the bowels protrude; a weakness and relaxation of the margins of these apertures; a preternatural laxity of the peritonæum; an unusually long mesentery, or omentum, &c. It is very certain, that, with regard to the abdominal ring, the transverse tendinous fibres, which naturally cross and strengthen its upper and outer part, are much weaker in some subjects than others. No idea seems more prevalent in books, than, that taking a good deal of oil with our food, is conducive to the occurrence of ruptures. Some of the alleged pre-disposing causes, may justly excite scepticism; but there are several circumstances which tend to prove, that a natural deficiency of resistance, in any part of the parietes of the abdomen, is certainly a cause of this kind. We need only mention, how very liable persons are, who have had the peritonæum wounded, to the present disease; (See *Richerand's Nosogr. Chir. T.* 3, *p.* 317, *and Schmucker's Vermischte Chir. Schriften B.* 1, *p.* 197.) and how much more liable men are than women so the inguinal hernia, owing evidently to the larger size of the abdominal ring in the former, than the latter subjects. These, however, having a larger space for the protrusion of the viscera, below Poupart's ligament, are more exposed than men to femoral herniæ.

With regard to the *exciting* causes, our knowledge is involved in less doubt. The grand cause of this kind, is the powerful action of the abdominal muscles and diaphragm on the viscera. In feats of agility, such as jumping, &c. the pressure which the contents of the abdomen must often encounter, sufficiently accounts for their protruding at any part, where the abdominal parietes do not make adequate resistance. The same consideration explains, why herniæ very often take place in lifting and carrying heavy weights, running, vomiting, straining at stool, parturition, &c. and in people who inhabit mountainous countries.

This diminution of the capacity of the abdomen, by the action of the abdominal muscles and diaphragm, on many occasional exertions, must take place in every one, by reason of the common habits and necessities of life. But, as only a certain number of persons meet with the disease, it is fair to infer, that, either the exciting causes must operate with greater force in them than in the generality of people, or else that their abdominal parietes have not been capable of the ordinary degree of resistance. Many patients who meet with herniæ, in making violent efforts and exertions, may be in the former circumstance; while others, who have their viscera protruded from such trivial things as coughing, sneezing, crying, &c. must be considered, as being under the influence of some predisposing cause. A gentleman, who has gained great honour by a most valuable treatise on hernia, remarks, that, "herniæ, which originate in predisposition, generally come on gradually, and almost imperceptibly; while those which are produced by bodily exertions, are formed suddenly, and by the immediate action of the exciting cause. The occurrence of the complaint is often indicated, in the first instance, by a fulness, combined with a sense of weakness, about the abdominal ring. The swelling is increased by any action of the respiratory muscles, and disappears on pressure, and in the recumbent position of the body. It gradually finds its way through the tendon of the external oblique muscle, into the groin, and afterwards into the scrotum. When a hernia takes place suddenly, it is generally attended with a sensation of something giving way at the part, and with pain." (*Lawrence on Ruptures, p.* 29, *Edit.* 3.)

Upon the subject of the immediate cause of herniæ, it is observed by Scarpa, that several of the most celebrated modern surgeons, as, for instance, Warton, (*Adenograph. cap.* 11.) Benevoli, (*Dissertazioni Chirurgische,* 1.) Rossius, (*Acta Nat. cur, Tom.* 2, *Obs.* 178), Brendel (*de herniarum natalibus*) and Morgagni, (*de sed. et caus. morb. epist.* 43, *art.* 13), consider a relaxation and elongation of the mesentery, as the principal cause of herniæ in general, and of the bubonocele in particular. Hence it happens, say they, that the whole mass of intestines, or only a portion of an intestine, descends against the inner orifice of the inguinal ring, comes into contact with this opening, and gradually makes its way out of the abdomen. In examining this pathological point without prejudice, it is incontestable, says Scarpa, that an intestine cannot be moved beyond its natural limits, unless that part of the mesentery, which retains and fixes the bowel in its proper place, be at the same time elongated. But, it does not follow from this, that a relaxation of the mesentery must precede the displacement of the intestine. It appears to Scarpa much more probable, that these two events are simultaneous, and depend upon one and the same cause.

"In the healthy state, (observes this interesting writer) the abdomen, considered altogether, is submitted to two opposite forces, which reciprocally balance each other. One is the pressure of the viscera against the abdominal parietes; the other is the reaction of these same parietes upon the viscera, which they contain. If these two forces were in perfect equilibrium in all individuals, and under all the circumstances of life, we should not be in the least subject to herniæ. If, when the equilibrium has been broken, every point of the parietes of the belly were to yield equally to the impulse of the viscera, an increase of the volume of the whole abdomen would be the consequence; but, a true hernia would never happen. The cavity of the abdomen is always completely full. The containing and contained parts react upon, and reciprocally compress one another. It is by the effect of this moderate, but equal and unremitting pressure, that all the viscera mutually support each other. Without it, the ligaments of the liver, those of the spleen, and the various membranous bands of the intestines in general, would only be feeble means for fixing such parts in their respective situations. But, there are certain points of the abdominal parietes which naturally present much less resistance than others, and which react with much less power against the pressure made from within outwards by the abdominal viscera. Such is particularly the part, which extends from the pubes to the anterior superior spinous process of the ilium. This relative weakness of some points of the abdominal parietes is very marked in certain individuals, in consequence of a defect of organization. It may also be increased by internal or external causes, which are as various as they are numerous. When, in one of these cases, the pressure made by the viscera is unusually increased, as happens in a violent effort, a defect in the equilibrium between the two forces above mentioned is occasioned; that is to say, the reaction of the abdominal parietes is no longer proportioned, at least at certain points, to the force of the impulse of the viscera. The conjoined powers of the abdominal muscles, diaphragm, and levator ani, are then directed and concentrated against the most feeble point of the abdomen, towards which they propel the nearest viscus, or that, which, from its moveableness, is the most liable to displacement. If such viscus should happen to be the noose of an intestine, it is evident, that the power, which tends to make it protrude from the belly, must at the same time act upon the corresponding portion of the mesentery; and the intestine, in passing through the parietes of the abdomen, drags the mesentery after it, and makes this membrane yield and become elongated. When the displaced viscera meet with little resistance on the part of the parietes of the abdomen, the hernia is quickly formed, and the elongation of the mesentery occurs with equal celerity. We have an example of this in the inguinal congenital hernia: in this case, the intestine is, in some measure, precipitated into a sac previously prepared for its reception. On the contrary, in the ordinary inguinal hernia, a totally different disposition of the parts renders the progress of the disease much slower. In most instances, the hernia is not formed immediately the equilibrium between the impulse of the viscera and the reaction of the abdominal parietes, is broken. But in the groin, a slight elevation is first observed, which reaches from the anterior superior spinous process of the ilium to the inguinal ring. Some time afterwards, when the intestine has made its appearance on the outside of the ring, the enlargement of the hernia, and the elongation of the mesentery, make much more rapid, though always simultaneous progress.

"Numerous practical observations, (says Scarpa) concur in proving the foregoing account, that we must not search for the immediate cause of herniæ in the relaxation of the mesentery, but rather in a want of equilibrium between the pressure of the viscera and the resistance of one or several points of the abdominal parietes. Indeed, herniæ are seen occurring from the slightest causes in infants, in whom the neck of the tunica vaginalis is not speedily obliterated, and in individuals, who, from being fat have all on a sudden become extremely thin. Such women as have had children, are more subject to the disease than others. Persons also of both sexes, who carry considerable burdens, or who play upon wind instruments, or who have suffered a forcible contusion of the abdomen, are particularly exposed to the disorder, even though there is not the least reason for suspecting in them a relaxation of the mesentery. Vaginal herniæ, which arise after difficult labours, afford another proof of the same truth: their cause is owing to a laxity and weakness of the parietes of the vagina, which, not being capable of making any further resistance to the pressure of the viscera situated in the cavity of the pelvis, at length suffer these parts to protrude.

"With respect to the second proposition, that during the formation of a hernia, the combined force of all the abdominal muscles is, as it were, directed and concentrated against the most feeble point of the parietes, we see a proof of it in a fact that occurs to our observation every day. In order to convince ourselves of this, it is enough to notice the individuals afflicted with herniæ: if they cough, or sneeze; in a word, if they make the slightest effort, they instantly find the size of the swelling increased, and hasten to support the part with their hand. During the slightest shocks, which render the herniæ larger, it is also indisputable, that the mesentery is elongated in the same proportion as the intestine protrudes. All the viscera have such a tendency to be displaced and carried towards the weakest point of the parietes of the abdomen, that even those, which are naturally the most distant from it, and are the most firmly fixed by the folds of the mesentery, may in their turn descend into the herniæ. Anatomical knowledge alone would never have led us to have a suspicion of the possibility of these occurrences. Sandifort and Paletta have found, in an umbilical herniæ, the cæcum, with a portion of the ilium and colon. (*Obs. Pathol. cap.* 4, *& Nova Gubernaculi testis Descriptio.*) Mauchart, Camper, and Bose, have met with the cæcum in an inguinal hernia of the left side. (*De Hern. Incarc. in Halleri Disput. Chirurg. Tom.* 3. *Demonstrat. anat. patkolog. lib.* 2. *p.* 18, *& Animadvers. de hern. inguin. p.* 5.) Lassus has seen the left colon protrude at the right inguinal ring. (*Médecine Opératoire, Tom.* 1, *p.* 173.) If it be proved by all these facts, that such viscera, as are the most closely united to the great sac of the peritoneum and neighbouring parts, are nevertheless liable to form herniæ; and if such displacements cannot happen without a considerable elongation of the membranous bands fixing these bowels in their natural situation, how can we refuse to admit, that a noose of intestine, pushed by degrees through the inguinal ring, drags along with it the corresponding portion of the mesentery? In order to explain this event, there is no necessity for supposing a partial relaxation of the mesentery."

(*Traité Pratique des Hernies, Par A. Scarpa, trad. de l'Italien, p.* 37—43.)

The general symptoms of a hernia, which is reducible, and free from strangulation, are; an indolent tumour at some point of the parietes of the abdomen; most frequently descending out of the abdominal ring, or from just below Poupart's ligament, or else out of the navel; but, occasionally, from various other situations, as will be presently explained. The swelling often originates suddenly, except in the circumstances above related, and, it is subject to a change of size, being smaller when the patient lies down on his back, and larger when he stands up, or holds his breath. The tumour frequently diminishes when pressed, and grows large again when the pressure is removed. Its size and tension often increase after a meal, or when the patient is flatulent. Patients with hernia, are apt to be troubled with colic, constipation, and vomiting, in consequence of the unnatural situation of the bowels. Very often, however, the functions of the viscera seem to suffer little or no interruption.

If the case be an *enterocele*, and the portion of intestine be small, the tumour is small in proportion; but, though small, yet, if the gut be distended with wind, inflamed, or have any degree of stricture made on it, it will be tense, resist the impression of the finger, and give pain upon being handled. On the contrary, if there be no stricture, and the intestine suffers no degree of inflammation, let the prolapsed piece be of what length it may, and the tumour of whatever size, yet the tension will be little, and no pain will attend the handling it; upon the patient's coughing, it will feel as if it were blown into; and, in general, it will be found very easily returnable. (*Pott.*) A guggling noise is often made when the bowel is ascending.

If the hernia be an *epiplocele*, or one of the omental kind, the tumour has a more flabby, and a more unequal feel; it is in general perfectly indolent, is more compressible, and (if in the scrotum) is more oblong, and less round, than the swelling occasioned in the same situation by an intestinal hernia; and, if the quantity be large, and the patient adult, it is, in some measure, distinguishable by its greater weight. (*Pott.*)

If the case be an *entero-epiplocele*, that is, one consisting of both intestine and omentum, the characteristic marks will be less clear than in either of the simple cases; but the disease may easily be distinguished from every other one, by any body in the habit of making the examination. (*Pott, p.* 28.)

As the smooth slippery surface of the intestine generally makes its reduction easier, than that of the omentum, we may infer, with Mr. Lawrence, "that, if a portion of the contents slip up quickly and with noise, leaving behind something which is less easily reduced, the case is probably an entero-epiplocele." (See *Treatise on Ruptures, Edit.* 3, *p.* 32.)

On the subject of prognosis, Mr. Pott remarks, "that the same kind of rupture, in different people, and under different circumstances, wears a very various face; the age and constitution of the subject, the date of the disease, its being free, or not free from stricture, or inflammation, the symptoms which attend it, and the probability or improbability of its being returnable, necessarily producing much variety; the degree of hazard attending this complaint will be also more or less, as it shall happen to be circumstanced.

"If the subject be an infant, the case is not often attended with much difficulty, or hazard; the softness and ductility of their fibres generally rendering the reduction easy as well as the descent; and though from neglect, or inattention, it may fall down again, yet it is as easily replaced, and seldom produces any mischief: I say seldom, because I have seen an infant, one year old, die of a strangulated hernia, which had not been down two days, with all the symptoms of mortified intestines. (For other examples of strangulated hernia in very young infants, refer to *Gooch's Chir. Works, Vol.* 2. *p.* 33, *Lawrence on Ruptures, p.* 65, *Edit.* 3; *Edinb. Med. and Surgical Journal, Vol.* 3, *p.* 470, *&c.*)

"If the patient be adult, and in the vigour of life, the consequences of neglect, or of mal-treatment, are more to be feared than at any other time, for reasons too obvious to need relating. The great and principal mischief to be apprehended, in an intestinal hernia, is an inflammation of the gut, and an obstruction to the passage of the aliment and feces through it; which inflammation and obstruction are generally produced by a stricture made on the intestine. In very old people, the symptoms do not usually make such rapid progress, both on account of the laxity of their frame, and their more languid circulation; and also that their ruptures are most frequently of ancient date, and the passage a good deal dilated; but then, on the other hand, it should also be remembered, that they are by no means exempt from inflammatory symptoms; and that, if such should come on, the infirmity of old age is no favourable circumstance in the treatment, which may become necessary.

"If the disease be recent, and the patient young, immediate reduction, and constant care to prevent its pushing out again, are the only means whereby it is possible to obtain a perfect cure.

"If the disease be of long standing, has been neglected, or suffered to be frequently down, and has given little or no trouble, the aperture in the abdominal muscle, and the neck of the hernial sac, may both be presumed to be large; which circumstances in general render immediate reduction less necessary and less difficult, and also frustrate all rational expectation of a perfect cure. On the contrary, if the rupture be recent, or, though old, has generally been kept up, its immediate reduction is more absolutely necessary, as the risk of stricture is greater from the supposed smallness of the aperture, and narrowness of the neck of the sac. If the rupture be very large and ancient, the patient far advanced in life, the intestine not bound by any degree of stricture, but does its office in the scrotum regularly, and no other inconvenience be found to attend it, but what proceeds from its weight, it will in general be better not to attempt reduction, as it will, in these circumstances, most probably prove fruitless, and the handling the parts in the attempt, may so bruise and injure them as to do mischief; but this must be understood to be spoken of those only in which there is not the smallest degree of stricture, nor any symptom of obstruction in the intestine; such circumstances making reduction necessary at all times, and in every case.

"With regard to the contents of a hernia, if it be a portion of omentum only, and has been gradually formed, it seldom occasions any bad symptoms, though its weight will sometimes render it very troublesome. But if it be produced suddenly, by effort or violence, that is, if a considerable piece of the caul by accident slip down at once, it will sometimes prove painful, and cause very disagreeable complaints; the connexion between the omentum, stomach, duodenum, &c. being such as to render the sudden descent of a large piece of the first sometimes productive of nausea, vomiting, colic, and all the disagreeable symptoms arising from the derangement of these viscera. When the piece of caul is engaged in such a degree of stricture as to prevent the circulation of blood through it, it will sometimes, by becoming gangrenous, be the occasion of very bad symptoms, and even of death, as I have more than once seen: and thus, as a mere omental hernia, it may sometimes be subject to great hazard. But even though it should never be liable to the just mentioned evil, that is, though the portion of the caul should remain uninjured in the scrotum et it renders the patient constantly liable to hazard from another quarter; it makes it every moment possible for a piece of intestine to slip into the same sac, and thereby add to the case all the trouble and all the danger arising from an intestinal rupture. It is by no means an uncommon thing for a piece of gut to be added to a rupture, which had for many years been merely omental, and for that piece to be strangulated, and require immediate help.

"An old omental hernia is often rendered not reducible, more by an alteration made in the state of the prolapsed piece of caul, than by its quantity. It is very common for that part of the omentum which passes through the neck of the sac, to be compressed into a hard, smooth body, and lose all appearance of caul, while what is below in the scrotum is loose and expanded, and enjoys its natural texture; in this case, reduction is often impossible, from the mere figure of the part; and I have so often seen this, both in the living and the dead, that I am satisfied, that for one omental rupture, rendered irreducible by adhesions, many more become so from the cause abovementioned.

"In the sac of old omental ruptures that have been long down, and only suspended by a bag truss, it is no very uncommon thing to have a pretty considerable quantity of fluid collected: this, in different states and circumstances of the disease, is of different colour and consistence, and seldom so much in quantity as to occasion any particular attention to it; but on the other hand, it sometimes is so much in quantity as to become an additional disease to the original one. I have more than once been obliged to let it out, in order to remove the inconvenience arising from its weight, and the distention of the scrotum, which I have also seen become gangrenous by the neglect of this operation.

"If the hernia be of the intestinal kind, merely, and the portion of gut be small, the risk is greater, strangulation being more likely to happen in this case, and more productive of mischief, when it has happened: for the smaller the portion of gut is which is engaged, the tighter the tendon binds, and the more hazardous is the consequence. I have seen a fatal gangrene, in a bubonocele, which had not been formed forty-eight hours, and in which the piece of intestine was little more than half an inch. There are few practitioners, who have seen business, but know the truth of this; but perhaps the reason of it is not sufficiently explained to the unknowing: it is this; when a considerable portion of intestine passes out from the belly in a hernial sac, it necessarily and unavoidably carries with it a proportional quantity of the mesentery, which every body knows is a strong double membrane. When the prolapsed part is at all considerable, this double membrane is again in some measure folded on itself, and takes off a good deal of the effect of the stricture on the intestine. Now although this circumstance will not prevent the effect, if the means of relief be totally neglected, yet it will most certainly retard the evil, and give more time for assistance; whereas, when there is little or none of the mesentery got through the tendon, and the thin, tender intestine bears all the force of the stricture, it is immediately brought into hazard.

"The practical inference to be drawn from hence, is too obvious to need mentioning.

"In the intestinal, as in the omental hernia, they which have been often or long down, are in general more easily returned, and do not require such immediate assistance, as they which have seldom been down, or have recently descended; and in the one kind of hernia, as well as in the other, the state of the hernial sac, with regard to size, thickness, &c. depends very much on the date of the disease, and the regard that has been paid to it.

"If the hernia be caused by a portion of the intestine ilium only, it is in general more easily reducible than if a part of the colon has descended with it, which will also require more address and more patience in the attempt. The reduction of a mere intestinal hernia too (*cæteris paribus*) will always remain more practicable than that of a mere omental one, after it has attained to a certain size and state, as the part contained within the former is liable to less alteration of form than that within the latter; which alteration has already been mentioned as no infrequent hindrance of the return of an old caul rupture.

"Not that the parts within a mere intestinal hernia are absolutely exempt from such an alteration as may render their return into the belly impracticable, even where there is no stricture; for I have seen that part of the mesentery, which has lain long in the neck of the sac of an old rupture, so considerably hardened and thickened, as to prove an insuperable obstacle to its reduction.

"Upon the whole, every thing considered, I think it may be said, that an intestinal rupture is subject to worse symptoms, and a greater degree of hazard, than an omental one, though the latter is, by no means, so void of either as it is commonly supposed to be; that bad symptoms are more likely to attend a recent rupture than one of ancient date; that the descent of a very small piece of intestine is more hazardous than that of a larger: that the hernia, which consists of gut only, is in general attended with worse circumstances than that which is made up of both gut and caul; and that no true judgment can be formed of any rupture at all, unless every circumstance relating to it be taken into consideration." (*Pott on Ruptures.*)

Mr. Hey coincides with Pott, in thinking the prognosis more unfavourable when the tumour is small. "I think it is not a bad general rule, that the smaller the hernia, the less hope there is of reducing it by the taxis. Long-continued efforts to reduce a prolapsed intestine, are most likely to succeed in old and large hernias, when no adhesions have taken place." (*Pract. Observ. in Surgery, p.* 203.)

"The opening (says Mr. Lawrence) through which the parts protrude, is narrower in some situations than in others; the progress of the case will therefore be more rapid, and the danger of the patient more urgent. The aperture is generally very small in femoral hernia; this kind of rupture in men, and the bubonocele in women, have a particularly narrow entrance. On the same grounds, femoral, inguinal, and umbilical, ruptures are more dangerous, than the ventral, perineal, or vaginal kinds." (*Treatise on Ruptures, p.* 63, *Edit.* 3.)

### GENERAL OBSERVATIONS ON THE TREATMENT OF HERNIÆ.

1. *Treatment of those which are capable of easy and immediate reduction, and are not attended by any troublesome or bad symptoms.*

"This case," says Pott, "is very frequently met with in infants, and sometimes in adults, and is too often neglected in both. In the former, as the descent seldom happens but when the infant strains to cry, and the gut is either easily put up, or returns *suâ sponte*, as soon as the child becomes quiet, it often is either totally unattended to, or an attempt made to restrain it only by a bandage made of cloth, or dimity, and which being ineffectual for such purpose, lays the foundation for future trouble and mischief.

"This is, in great measure, owing to a common opinion, that a young infant cannot wear a steel truss; a generally prevailing error, and which ought to be corrected. There is no age at which such truss may not be worn, or ought not to be applied; it is, when well made, and properly put on, not only perfectly safe and easy, but the only kind of bandage that can be depended upon: and as a radical cure depends greatly on the thinness of the hernial sac, and its being capable of being so compressed as possibly to unite, and thereby entirely close the passage from the belly, it must therefore appear to every one who will give himself the trouble of thinking on the subject, that the fewer times the parts have made a descent, and the smaller and finer the elongation of the peritoneum is, the greater the probability of such cure must be.

" The same method of acting must, for the same reasons, be good in every age in which a radical cure may reasonably be expected; that is, the prolapsed parts cannot be too soon returned, nor too carefully prevented from falling down again, every new descent rendering a cure both more distant and more uncertain.

" As soon as the parts are returned, the truss should be immediately put on, and worn without remission, care being taken, especially if the patient be an infant, to keep the parts on which it presses constantly washed, to prevent galling.

" It can hardly be necessary to say, that the surgeon should be careful to see that the truss fits, as his success and reputation depend on such care. A truss which does not press enough, is worse than none at all, as it occasions loss of time, and deceives the patient, or his friends; and one which presses too much, or on an improper part, gives pain and trouble, by producing an inflammation and swelling of the spermatic chord, and sometimes of the testicle.

" In adults, whose ruptures are of long standing, and accustomed to frequent descent, the hernial sac is generally firm and thick, and the aperture in the tendon of the abdominal muscle large; the freedom and ease with which the parts return into the belly when the patient is in a supine posture, and the little pain which attends a rupture of this kind, often render the persons who labour under it careless: but all such should be informed, that they are in constant danger of such alteration in their complaint, as may put them into great hazard, and perhaps destroy them. The passage from the belly being open, the quantity of intestine in the hernial sac is always liable to be increased, and when down, to be bound by a stricture. An inflammation of that portion of the gut which is down, or such obstruction in it as may distend and enlarge it, may at all times produce such complaints as may put the life of the patient into imminent danger; and therefore, notwithstanding this kind of hernia may have been borne for a great length of time, without having proved either troublesome or hazardous, yet as it is always possible to become so, and that very suddenly, it can never be prudent or safe to neglect it.

" Even though the rupture should be of the omental kind, (which considered abstractedly is not subject to that degree or kind of danger to which the intestinal is liable) yet it may be secondarily, or by accident, the cause of all the same mischief; for while it keeps the mouth of the hernial sac open, it renders the descent of a piece of intestine always possible, and consequently always likely to produce the mischief which may proceed from thence.

" They who labour under a hernia thus circumstanced, that is, whose ruptures have been generally down while they have been in an erect posture, and which have either gone up of themselves, or have been easily put up in a supine one, should be particularly careful to have their truss well made, and properly fitted; for the mouth of the sac, and the opening in the tendon being both large and lax, and the parts having been used to descend through them, if the pad of the truss be not placed right, and there be not a due degree of elasticity in the spring, a piece of intestine will, in some posture, slip down behind it, and render the truss productive of that very kind of mischief which it ought to prevent.

" It is scarcely credible how very small an opening will serve for a portion of gut or caul to insinuate themselves into at some times. Now, though in persons of mature age it most frequently proves impracticable so to compress the mouth of the hernial sac, as absolutely to close it, yet by the constant use of a well-made truss, it may be so lessened, as to render the descent of a piece of intestine into it much more difficult; from whence we may learn the great consequence of having the part completely reduced before the truss is applied, and the danger that may be incurred by laying such bandage aside after it has been worn some time; since the same alteration which renders the descent of the gut less easy, will also make the reduction more difficult, if a piece should happen to get down; and hence also we may learn why the bandage should be long and unremittingly worn by all those whose time of life makes the expectations of a perfect cure reasonable, many of the ruptures of adults being owing to the negligent manner in which children at school are suffered to wear their trusses.

" I know a gentleman who has for some years had an omental rupture, which was neglected while he was young, and he having naturally a lax habit, and the abdominal opening being much dilated, he finds it extremely difficult to keep it up, even with the best truss he can get, behind which it will sometimes slip down: when this happens, it gives him such immediate and acute pain at his stomach, and makes him so intolerably sick, that he is obliged immediately to throw himself on his back, and procure the return of the piece of omentum." (*Pott on Ruptures.*)

Besides the danger of strangulation, when a reducible hernia is neglected, and allowed to remain down, there are other motives for keeping up the tumour with a truss, and preventing its increase of size. "The vast size to which neglected herniæ sometimes increase, not only prohibits all active exertion, but, by involving, in the male, the integuments of the penis, incapacitates the subject from the act of copulation, and gives rise to excoriation from the discharge of the urine over the swelling. Probably, too, the testis may be affected by the pressure of a very large scrotal hernia. (*Morgagni de Caus. et Sed. Ep.* 33, *Art.* 12; *Schmucker Vermischte Chir. Schriften, b.* 3, *p.* 195.) Disorders of the intestinal functions invariably attend these large ruptures, and increase in frequency and violence in proportion to the size of the swelling, and age of the patient. All the moveable viscera of the abdomen gradually find their way into the hernial sac, if a rupture be entirely neglected." (*Lawrence on Ruptures, p.* 67, *Edit.* 3. 1816.)

When we have considered the anatomy of particular herniæ, we shall be better able to judge of the proper construction of trusses. (See *Truss.*)

### TREATMENT OF IRREDUCIBLE HERNIÆ, FREE FROM INFLAMMATION, AND UNATTENDED WITH TROUBLESOME OR DANGEROUS SYMPTOMS.

"This incapacity of reduction (says Pott) may be owing to several causes, but most frequently arises either from the largeness of the quantity of the contents, from an alteration made in their form and texture, or from connexions and adhesions, which they have contracted with each other or with their containing bag.

"I have already mentioned it as my opinion that ruptures are sometimes rendered difficult to be reduced, by that portion of the intestinal canal which is called the cæcum or the beginning of the colon, being contained in the hernial sac. Of which fact I am as much convinced as the nature of such kind of things will permit; that is, by observations made both on the living and the dead.

"When a hernia of this kind (viz. one containing such a part of the intestinal tube) has been long neglected, and suffered to remain in the scrotum without any bandage at all to support its weight, the hernial sac being constantly dragged down, and kept in a state of distention, necessarily becomes thick, hard, and tough; by this means the diameter of its neck is lessened, and the return of the intestine back from the scrotum into the belly rendered more and more difficult, as the parts through which it is to pass become harder, and less capable of yielding. This will, indeed, in time, prove an obstruction sufficient to hinder any part of the intestine, or even of the omentum, from being returned; but the more the difficulty is, which proceeds from the mere figure and size of the portion of gut, the greater will be the obstruction when added to that arising from the just-mentioned cause.

"An alteration produced by time, and constant, though gentle, pressure in the form and consistence, or texture of the omentum, is also no infrequent cause, why neglected omental ruptures become irreducible.

"The cellular membrane in all parts of the body, however loose and light its natural texture may be, is capable of becoming hard, firm, and compact, by constant pressure. Of this there are so many, and so well known instances, that it is quite unnecessary to produce any.

"The omentum, from its texture, is liable to the same consequence. When a portion of it has been suffered to remain for a great length of time in the scrotum, without having ever been returned into the belly, it often happens that although that part of it which is in the lower part of the hernial sac preserves its natural soft, adipose, expansile state, yet all that part which passes through what is called the neck of the sac is, by constant pressure, formed into a hard, firm, incompressible, carnous kind of body, incapable of being expanded, and taking the form of the passage in which it is confined, exactly filling that passage, and rendering it impossible to push up the loose part which fills the scrotum.

"This is no theoretic opinion, but a fact, which I have seen and proved often; and whoever will reflect on it, will immediately find in it one insuperable objection to the return of some old omental ruptures.

"The same reason for incapacity of reduction is also sometimes met with in ruptures of the intestinal kind, from an alteration produced on that part of the mesentery which has been suffered to lie quiet for a great length of time in the neck of an old hernial sac.

"The other impediment, which I mentioned to the return of old ruptures, is the connexion and adhesion of the parts, either with each other, or with the bag containing them. This is common to both the intestinal and omental hernia, and is produced by slight inflammations of the parts, which have been permitted to lie long in contact with each other, or perhaps in many cases from the mere contact only. These adhesions are more or less firm in different cases, but even the slightest will almost always be found an invincible objection to the reduction of the adherent parts, by the hand only.

"Many, or perhaps most of these irreducible ruptures become so by mere time and neglect, and might at first have been returned; but when they are got into this state, they are capable of no relief from surgery but the application of a suspensory bag, to take off or lessen the* inconvenience arising from the weight of the scrotum.

"People in this situation should be particularly careful not to make any attempts beyond their strength, nor aim at feats of agility; they should take care to suspend the loaded scrotum, and to keep it out of the way of all harm from pressure, bruise, &c. When the tumour is very large, a soft quilted bolster should be worn at the bottom of the suspensory to prevent excoriation, and the scrotum should be frequently washed for the same reason; a loss of skin in this part, and in such circumstances, being sometimes of the utmost importance. They ought also to be particularly attentive to the office of the intestinal canal, to see that they do not by any irregularity of diet disorder it, and keep themselves from being costive, for reasons too obvious to need relating. By these means, and with these cautions, many people have passed their lives for many years free from disease, or complaint, with very large irreducible ruptures.

"On the other hand, it is fit that mankind should be apprised, that the quiet, inoffensive state of this kind of hernia is by no means to be depended upon; many things may happen to it, by which it may be so altered, as to become hazardous, and even fatal: an inflammation of that part of the gut which is down, any obstruction to the passage of the aliment or feces through it, a stricture made by the abdominal tendon, either on what has been long down, or on a new portion which may at any time be added to it, are always capable of so altering the state of the case, as to put the life of the patient into danger.

"Indeed the hazard arising from a stricture made on a piece of intestine contained in the sac of an old irreducible hernia, is in one respect greater, than that attending one that has been found at times reducible; since from the nature of the case it will hardly admit of any attempt toward relief, but the operation, and that in these circumstances must necessarily be accompanied with additional difficulty.

"Among the ruptures which have been thought not reducible, and treated as such, there have been some which, upon more judicious and more patient attempts, have been found capable of reduction.

"When this is suspected to be the case, the proper method is by absolute rest, in a supine posture, for a considerable length of time, by great abstinence, and the use of evacuants, so as to lessen the size of the parts in the hernial sac, and render them capable of passing back again into the belly." (*Pott on Ruptures.*)

Fabricius Hildanus gives an account of a man, who was radically cured of a rupture, of twenty years' date, by six months' confinement to bed. (*Cent.* 5, *Obs.* 54.)

Le Dran and Arnaud relate instances of monstrous bubonoceles, which disappeared entirely, after the patients had been long confined to bed, and become much emaciated, by tedious illnesses. Some of the moderns have imitated this operation of nature, and by frequent bleedings, and repeated purges, have sometimes so far reduced the size of the hernia, that it has been returned into the abdomen. Mr. Hey has several times succeeded in this way. (*P.* 219.) But, this practice cannot prove successful, when the viscera adhere to the sac, or to the peritoneum, just within the abdomen. The greatest objection to this method of cure, is the want of an absolute criterion, by which to distinguish, when the parts do, or do not adhere to the hernial sac, and, in advanced years, though one were sure, that the viscera were free from the sac, the possibility of hurting the body by the necessary evacuations, is also another objection. (*Sharp's Critical Enquiry, p.* 15.)

Were the plan to be thought worthy of

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*I am not unaware (says Pott) that most of these are capable of being cured by the operation for the bubonocele, as it is called; but as I should never think of proposing it in any case, in which there are not symptoms, that threaten the life of the patient, so I have not mentioned it in this place as a means of cure. I also am not unapprised what influence a successful operation or two of this sort has had on the unknowing; but I also know, that such accidental successes have emboldened the same operators to commit more than one or two murders, in similar cases; and that, from the prevalence of fashion, some of these rupture-doctors have been largely rewarded, when they ought to have been hanged.

trial, keeping up a constant pressure on the tumour, by means of a suspensory bandage, made to lace in front, would be proper for promoting the absorption of the thickened parts in the hernial sac. Mr. A. Cooper has reduced such herniæ, after applying ice to them, the good effects of which he imputes to its producing a contraction of the scrotum, which performs the office of a strong and permanent compression of the tumour.

Whenever any attempts of this kind succeed, "a truss should be immediately put on, and worn constantly without remission; for, in these people, the largeness of the abdominal aperture, the thickness of the hernial sac, and the relaxation of the mesentery, make a new descent always to be apprehended, and guarded against." (*Pott.*)

However there are instances on record, in which the capacity of the abdomen had become so adapted to the diminished quantity of the viscera, that when the contents of the hernia were reduced, serious complaints arose from their introduction into the belly. Schmucker has met with several such cases, in which he has been obliged to take off the truss. Petit has known the reduction of a hernia of this kind prove fatal, the parts not descending again when the truss was removed, the nausea and vomiting, which arose, continuing, and peritonitis taking place. (*Chirurgische, Wahrnehmungen, Vol. 2, p.* 243. *Traité des Maladies Chirurgicales, Tom.* 2, *p.* 392.)

Mr. Pott remarks, that "an omental rupture, which has been so long in the scrotum as to have become irreducible, is very seldom attended with any bad symptoms, considered abstractedly; but, it is constantly capable of being the occasion of an intestinal hernia, and all its consequences; neither is that all, for the omentum, either so altered in form and texture, or so connected as to be incapable of reduction, may by accident inflame, and either become gangrenous, or suppurate, and the occasion of a great deal of trouble." In a few instances, epiploceles produce very bad symptoms indeed, cases of which are to be found in Garengeot, Dionis, &c.

Sometimes, in old cases of entero-epiplocele, the intestine is reducible, but the omentum is not, in which case some have advised keeping up the piece of bowel with a truss, the pad of which must be so contrived as not to press on the omentum. Mr. Pott, however, contends, that this is not often practicable, and, should such a truss be used, he advises its being particularly attended to, lest a small piece of gut slip down, and, being pressed on by the truss, produce fatal mischief.

"Irreducible herniæ must of course be exposed to all the consequences of external injury and violence; hence, various cases are recorded, in which the bowels have been burst by blows, falls, &c." (*Lawrence on Ruptures, p.* 110, *Edit.* 3.)

For examples of such accidents, Mr. Lawrence refers to *A. Cooper on Hernia, Part* 2, *Pref. p.* 2, *and to Travers's Enq. into the Process of Nature, &c. p.* 37. A case is also mentioned from Scarpa, *p.* 310, in which a violent exertion caused a sudden return of a hernia, which had been long regarded as cured. The viscera lay in the tunica vaginalis, which was burst to the extent of an inch.

### SYMPTOMS AND TREATMENT OF A STRANGULATED, OR AN INCARCERATED, HERNIA.—MEANS TO BE TRIED, BEFORE AN OPERATION.

"Difficulty of reduction (says Pott) may be owing to several causes. The size of the piece of omentum, or the inflamed state of it; the quantity of intestine and mesentery, an inflammation of the gut, or its distention by feces, or wind: or the smallness of the aperture of the tendon, through which the hernia passes. But, to whatever cause it be owing, if the prolapsed body cannot be immediately replaced, and the patient suffers pain, or is prevented thereby from going to stool, it is called an *incarcerated hernia, a strangulated hernia*, or *a hernia with stricture.*

"The symptoms are a swelling in the groin, or scrotum, resisting the impression of the fingers: if the hernia be of the intestinal kind, it is generally painful to the touch, and the pain is increased by coughing, sneezing, or standing upright. These are the very first symptoms, and, if they are not relieved, are soon followed by others, viz. a sickness at the stomach, a frequent retching, or inclination to vomit, a stoppage of all discharge per anum, attended with a frequent, hard pulse, and some degree of fever."

A patient, thus circumstanced, is in some danger, and demands immediate assistance. A stricture made on the prolapsed part of the gut, by the aperture, through which it passes, is the immediate cause of all the bad symptoms, and of course, the removal of such stricture is the only thing which can bring relief. This object can only be accomplished by returning the bowel back into the abdomen, or dividing the parts, which form the stricture. The former plan is always the most desirable, when practicable.

We next proceed to notice the various measures to be adopted for the relief of a strangulated hernia, so as to obtain the best chance of doing away the necessity of an operation. After treating of the merits of each plan, a few remarks will be offered on the order in which the means should be put in practice, a subject that has been most lamentably neglected, even by the latest writers on this interesting disease.

*Taxis.*—This is the term applied to the operation of reducing a hernia with the hand. It is much promoted by the position of the patient's body; Winslow thought it advantageous to have it placed in an inclined plane, and the thighs bent towards the trunk. Mr. A. Cooper advises the same practice, observing, that this posture, by relaxing the fascia of the thigh, relaxes also the aperture, through which the hernia passes. Every degree of tension, and relaxation of the femoral fascia must undoubtedly be attended with a corresponding change in the abdominal ring. But flexion of the thigh, besides relaxing this fascia, also relaxes the abdominal, internal iliac, and psoas muscles. The pressure, which is made on the tumour by the hands of the surgeon, should always be directed upwards and outwards, in cases of inguinal hernia, along the course of the spermatic cord, and Mr. A. Cooper advises it to be continued from a quarter to half an hour. (*On Inguinal and Congenital Hernia.*)

As the femoral hernia passes downwards, and then forwards, the pressure must be directed first backwards, and then upwards. No violence should ever be used, for, besides being unavailing, it must greatly aggravate the inflamed state of the contents of the hernial sac, and, it has even made the intestine burst. (See *Cooper on Inguinal Hernia, &c. p.* 23.)

Besides bending the thigh, care should also be taken to rotate it inwards, which will have great effect in relaxing the femoral fascia, and tendon of the external oblique muscle. Suspension of the patient over the shoulders of an assistant has been thought to facilitate reduction: "I have tried it often, (says Mr. Hey;) but have not found it to be of such superior efficacy, as some authors have represented." (*P.* 144.)

The return of a piece of intestine is generally preceded by a peculiar noise, caused by the passage of air through the stricture. It recedes at first gradually, and then slips up suddenly. The omentum goes up slowly to the very last portion, which must be actually pushed through the opening. If the taxis should not succeed at first, it will often do so after the warm bath, bleeding, or cold applications. Small herniæ, being attended with the closest stricture, are the most difficult to reduce, and, for the same reason, crural ruptures do not so often yield to the taxis, as inguinal ones in the male subject. The taxis becomes less likely to succeed, the longer the inflamed viscera have been down, because adhesions are likely to have formed. Mr. Lawrence observes, (*p.* 63.) "When the rupture becomes painful, we are no longer justified in persevering in attempts at reduction by the hand. A sufficient pressure cannot now be endured; and the force which is employed only tends to increase the inflammation, and accelerate the approach of gangrene. *At this period, the operation is required, and should be performed without delay.*" Desault even proscribed the taxis altogether in the inflammatory strangulation, until the previous use of other means had produced a change in the state of the swelling. However, I should never advise the reader to lose too much time in this way, on the supposition, that he can diminish the inflammation of a strangulated hernia in any other mode, than by delivering the bowels from the pressure of the stricture. Bleeding may check, but cannot stop, much less diminish, the inflammation, that prevails.

That, however, the taxis is frequently abused, and the cause of serious mischief, is a truth, which cannot be doubted. "Strangulated herniæ, (says Scarpa) very frequently mortify from the negligence of the patients, and their repugnance to submit to an operation, and, perhaps, still more frequently from the effect of the taxis, unskilfully exercised by uninformed surgeons, who are determined, at any price whatsoever, to accomplish the speedy reduction of the viscera. The majority of them make no distinction between the *acute* and the *chronic* strangulation. In both cases, no sooner are the symptoms of strangulation evinced, than they begin to handle the swelling roughly, and to push the viscera with all their force, in order to make them return into the abdomen; whilst, when the strangulation is *acute*, and the patient young and strong, the taxis ought never to be practised, before all the means proper for diminishing the strength, calming spasm, and relaxing parts, which are to be reduced, have been employed for a certain time. These means, we know, are bleedings, fomentations, emollient glysters, and, especially, the warm bath, which, next to bleeding, holds the first rank. At this school of surgery, I have frequently had opportunities of observing the salutary effect of this treatment. My pupils have, more than once, seen herniæ, which had been painfully handled without any good, reduced, as it were, spontaneously, after a bleeding, or whilst the patient was in the bath. If, what I have said upon the subject of the *acute* strangulation, and the treatment that it requires, were generally known by surgeons, I think, that the operations for strangulated herniæ would be less frequent. Things are different, with regard to the *chronic* strangulation of old large herniæ, in feeble, or aged persons; for, in these cases, it is of great importance to support the patient's strength. Bleedings, the warm bath, and other weakening means, should also be avoided, which, in producing a general atony, might bring on gangrene of the intestine, either during the strangulation, or after the reduction of the viscera. It is ascertained, that these kinds of strangulation are almost always occasioned by an accumulation of fecal matter, or an extraordinary quantity of air in the hernia. Nothing is more efficacious, than cold applications, for provoking the action of the bowel on the matter, which distends it, or for lessening the volume of the air. They produce a corrugation of all the scrotum, and contractions of the cremaster, which alone sometimes suffice for reducing the viscera, in a much better manner, than could be done by the hands of the most experienced surgeon." (*Scarpa, Traité des Hernies, p.* 244—247.)

*Bleeding.*—The inflammation, which attacks the protruded viscera, and spreads thence over the whole abdomen, and the temporary weakness and often fainting, which the sudden loss of blood induces, and which is a peculiarly favourable opportunity for reducing the hernia by the hand, are the reasons in favour of bleeding in the present disease. Sharp, Pott, B. Bell, Sabatier, Richter, Callisen, and Scarpa, names which can never be surpassed in respectability, are all subscribed in favour of bleeding. Wilmer, Alanson, and A. Cooper, have published against the practice. Mr. Hey has related two cases, which strongly evince the manner, in which bleeding facilitates the return of a hernia: the protruded viscera, in one instance, went up spontaneously, on blood being taken away; in the other, the taxis succeeded immediately afterwards, though the attempt before had been made in vain. (*P.* 125, 126.) Mr. Hey's experience, however, leads him to concur so far with Wilmer and Alanson, as to declare, that bleeding has generally failed to procure a reduction of the strangulated intestine, though he is persuaded that, in many cases, it may be used with advantage. But he cannot agree with Wilmer, that it generally renders the subsequent operation more dangerous. (*P.* 126.)—The majority of candid practitioners, I believe, will allow, that bleeding is always proper, when the hernia is small and recent; the abdomen tense and painful; and the patient young, strong, and plethoric.

*Purgative Medicines.*—My experience, (says Mr. Hey) leads me to condemn almost universally the use of purgatives taken by the mouth, while an intestine remains firmly strangulated. In the entero-epiplocele, when the intestine has retired, and the omentum remains strangulated; or in a simple strangulation of the omentum, where the intestine has not been prolapsed, purgatives are of great utility. So likewise in very large and old hernias, where there is reason to doubt, whether the disease is not to be considered as a morbid affection of the intestinal canal, rather than the effect of strangulation, purgatives may be as useful as in the simple ileus without hernia. While the intestine remains firmly strangulated, they usually increase the vomiting, and add to the distress of the patient. If they are to be tried at any time with hope of success, the trial would appear to have the greatest advantage when the vomiting has been removed by means of an opiate; yet I have repeatedly given them in vain during such an interval of relief. (*Practical Observations in Surgery, p.* 128.)

Purgatives are supposed to operate by exciting the peristaltic action of the intestine, and thereby extricating it from the stricture. Besides the above eminent surgeon, Pott and Richter have joined in their condemnation in general, and, to all appearances, with very great reason. Purgative glysters, certainly have not the objection of increasing the irritation; but, their efficacy is not deserving of much confidence. Mr. Hey says, he has never seen one case, in which either purgative, or emollient glysters produced a return of a strangulated hernia. Such injections will empty the large intestines; but, they have seemed to him to do no more. It is common also for a natural evacuation to be the immediate consequence of a strangulation. (*P.* 131.)

*Warm Bath.*—" Many instances (says Hey) are upon record of the good effect of warm bathing in procuring the reduction of a strangulated hernia. I have often seen it useful; but I have also often seen it fail of success. Whenever it is used in this disease, the patient should be placed, if possible, in a horizontal position. Gentle efforts with the hand to reduce the prolapsed part are perhaps attended with less danger, and with greater prospect of success, while the patient lies in the bath, than in any other position. The free use of opiates coincides with that of warm bathing, and under some circumstances, these means deserve to be tried in conjunction." (*P.* 132.)

*Cold Bath, and Cold Applications.*—The cold bath, and dashing of cold water on the patient are little to be depended upon, though success seems sometimes to have been obtained in this manner. (*Petit Traité des Mal. Chir. Tom.* 2, *p.* 325, *Hey, p.* 136.)

Wilmer, has strongly recommended the application of cold to the tumour itself, and this plan has acquired the approbation of the most celebrated modern surgeons. It is generally tried in conjunction with the effect of tobacco glysters, which will be presently noticed. Cold applications, in the form of ice, were indeed, particularly recommended by B. Bell. The best way is to pound the ice, tie it up in a bladder, and place it on the rupture. When ice cannot be procured, Mr. A. Cooper employs a mixture of equal parts of nitre and sal-ammoniac. To one pint of water, in a bladder, ten ounces of the mixed salts are to be added. "If, after four hours, (says this distinguished surgeon) the symptoms become mitigated, and the tumour lessens, this remedy may be persevered in for some time longer; but, if they continue with unabated violence, and the tumour resist every attempt at reduction, no farther trial should be made of the application." (*On Inguinal and Congenital Hernia.*) When ice has not been at hand, æther has occasionally been found a good substitute, when allowed to evaporate from the surface of the swelling.

Care must be taken, that the cold be not so applied as to freeze the scrotum, and bring on sloughing. (*A. Cooper, p.* 15.)

*Opiates.*—Mr. Hey has seen several cases, in which opiates, given freely, (in athletic persons after bleeding) have procured a reduction of strangulated hernia.

He cannot say, however, that this remedy is generally successful; but, it has the advantage of removing, for a time, the pain and vomiting usually attendant on strangulation, even though it prove ultimately inefficacious. Opiates should be given in large doses, when it is wished to try their effect in procuring reduction; and whenever the symptoms of strangulation return, after having been removed by opiates, the operation should be performed without delay. (*P.* 134, 135.)

*Tobacco Glysters.*—For this purpose, some surgeons prefer a decoction of tobacco, made by infusing, or boiling, one dram of the plant, for ten minutes, in a pint of water; others employ the smoke, which is prepared, and introduced into the rectum, by means of a well-known apparatus for the purpose. Perhaps, both methods are equally efficacious; but, as one requires an apparatus, while the other does not, and is equally proper, the decoction may be entitled to most recommendation. The machine for the smoke is also frequently found out of order. Tobacco glysters are, next to the operation, the most certain means of bringing about the reduction of the strangulated parts. They not only excite the action of the intestines, they also exert a peculiar depressing influence on the whole system, reducing the pulse, and causing nausea and sickness, cold sweats and fainting, under which circumstances the parts recede spontaneously, or may be easily reduced. Mr. A. Cooper prudently advises injecting half the above quantity at first; for, he has seen two drams, and even one, when used as an infusion, and introduced at once, prove fatal. (*P.* 24.) The rest should presently be injected, when it appears, that the tobacco does not operate with the extraordinary violence, with which it does in a few particular constitutions.

A case, recently published by Mr. C. Bell, looks to me very much like an example of the occasional poisonous effects of the tobacco clyster, though not reported as such by the author. At least, no particulars of any fatal mischief either in the tumor, or abdomen, are detailed, and it is remarked of the patient; "His strength held up until the tobacco clyster was administered to him, after which, he very suddenly fell low, and sunk." (*Surgical Obs. Part* 2, *p.* 189.) The smoke proved fatal in an instance witnessed by Desault, (*Œuvres Chir. T* 2, *p.* 344) and an infusion of ʒij. to ℥viij. of water seemed to produce sudden mortal effects in another example on record. (*Edinb. Med. and Surgical Journ. Vol.* 9, *p.* 159.)

*Poultices and Fomentations.*—We only make mention of these, to say, they have not the least confidence of any experienced, or intelligent surgeon. Whoever wastes time, in these urgent cases, in trying the effects of such applications, merits censure for his credulity, ignorance, and unfitness to undertake the treatment of a rapid disease, in which, as Pott remarks, if we do not get forward, we generally go backward; and whatever does no good, if it be at all depended upon, certainly does harm, by occasioning an irretrievable loss of time.

## OF THE ORDER, IN WHICH THE PRECEDING METHODS AND REMEDIES SHOULD BE TRIED, AND OF THE TIME, WHEN THE OPERATION SHOULD NOT BE DELAYED.

In the treatment of a strangulated hernia, a surgeon cannot be too deeply impressed with the danger of spending time in the trial of methods of inferior efficacy, or of such as are evinced to be ineffectual in the cases before them.

The rapidity, with which gangrenous mischief sometimes arises, and the patient loses his life, has been proved in a multitude of unfortunate examples, and should operate as a warning to all practitioners against the danger of deferring the operation too long. In the course of my reading, however, I have not met with so remarkable an instance of the sudden mortification, and rapidly fatal termination of a hernia, as the following case recorded by M. Larrey, in speaking of the fatiguing and forced marches performed by the French soldiers in Egypt. These marches, he says, brought on in one of the military "a hernia which formed suddenly, and became at the same time strangulated. He was immediately brought to my ambulance; but, a spontaneous gangrene, which had all on a sudden attacked the intestine, and extended to the other abdominal viscera, caused the patient's death in the space of two hours, and made it impossible for me to do the operation for him. This is the second example, that I have been acquainted with, in which the effects of the accident were thus rapid." (*Larrey, in Mémoires de Chirurgie Militaire, Tom.* 1, *p.* 196.)

The taxis is generally among the first things to be tried, and Mr. A. Cooper thinks the attempts should be continued for a quarter, or half an hour. When these have been ineffectual, the patient, if the circumstances do not forbid, should be immediately bled, and have a large opening made in the vein, so that the suddenness of the evacuation may be most likely to bring on fainting. The taxis should be tried once more as soon as this operation is finished.

In cases, where the strangulation is very *acute*, and the patient young and strong, perhaps, it may be most advisable to follow the advice delivered by Scarpa and Desault, and bleed the patient, and put him in the warm bath, before attempting the taxis.

If bleeding alone has been practised, and the manual efforts at reduction should not now succeed, the warm bath may be employed, *provided it can be got ready in a very short time*, but none should ever be lost in waiting for it to be prepared. When the bath is used, the taxis may be attempted, as the patient lies in the water; a situation, in which I have succeeded myself in reducing several herniæ.

Certainly not more, than one hour should ever be allotted for putting in practice the first attempts at reduction, bleeding, and the warm bath.

The plan should be, while the trial of one thing is going on, another should be preparing. So when the preceding measures have been tried in vain, the application of a bladder filled with ice, or the solution of salts, and the injection of tobacco, in the form of smoke, or decoction, should never be delayed for want of due previous preparation of all the requisites. Both these measures should be practised at the same time, immediately after the failure of the taxis, bleeding, and the warm bath. Mr. A. Cooper states, that four hours are enough for the trial of the tobacco glyster, together with cold applications.

In omental herniæ, the necessity for operating may frequently be obviated, by the good effects of bleeding, purgative medicines, and glysters, and leeches applied to the tumour. Mr. Lawrence has justly observed, that "when, as it very frequently happens, the aid of the surgeon is not required, until the complaint has lasted for some time, a trial of the tobacco, together with the topical use of cold, should be immediately resorted to, as circumstances will not admit of delay in the previous use of less powerful remedies." (*P.* 148, *Edit.* 3.)

Every man who has seen much of herniæ, will immediately recognize the propriety of the following sentiments of the experienced Mr. Hey:

"I can scarcely press in too strong terms the necessity of an early recourse to the operation, as the most effectual method of preserving life in this dangerous disease. If Mr. Pott's opinion be true, that the operation, when performed in a proper manner, and in due time, does not prove the cause of death oftener than perhaps once in fifty times; it would undoubtedly preserve the lives of many, to perform it almost as soon as the disease commenced, without increasing the danger by spending much time in the use of means, which cannot be depended upon for a cure.

"I have twice seen this disease prove fatal in about twenty-four hours. In such cases it is evident there is little time for delay. A surgeon, who is competent to perform the operation, is not perhaps consulted till the intestine is on the point of being mortified, or is actually in a state of mortification. The dilemma into which he is then cast, is painful indeed. But when the fullest opportunity is afforded him of using the best mode of treatment, I am satisfied that his success will be the greatest when the operation is not long delayed. This, at least, has been my own experience. When I first entered upon the profession of surgery, in the year 1759, the operation for the strangulated hernia had not been performed by any of the surgeons in Leeds. My seniors in the profession were very kind in affording me their assistance, or calling me into consultation when such cases occurred; but we considered the operation as the last resource, and as improper until the danger appeared imminent. By this dilatory mode of practice, I lost three patients in five upon whom the operation was performed. Having more experience of the urgency of the disease, I made it my custom, when called to a patient who had laboured two or three days under the disease, to wait only about two hours, that I might try the effect of bleeding (if this evacuation was not forbidden by some peculiar circumstances of the case) and the tobacco glyster. In this mode of practice I lost about two patients in nine upon whom I operated. This comparison is drawn from cases nearly similar, leaving out of the account those cases in which a gangrene of the intestine had taken place.

"I have now, at the time of writing this, performed the operation thirty-five times; and have often had occasion to lament that I had performed it too late, but never that I had performed it too soon. There are some cases so urgent, that it is not advisable to lose any time in the trial of means to produce a reduction. The delay of a few hours may cut off all hope of success, when a speedy operation might have saved the life of the patient." (*P.* 141, *&c.*)

To determine the exact moment, when to give up the trial of the preceding measures, and to have immediate recourse to the operation, is certainly difficult; but, no one can doubt, that this should rather be resorted to too early, than too late.

All directions must be general ones, liable to many exceptions: in rapid cases little, or no time should be allotted to the trial of any plan, and the operation should be done without the least delay. In other instances, we have full time to try the effects of every thing at all likely to succeed. The symptoms, which ought to guide us, in having recourse to the operation, arise from an attack of inflammation in that part of the intestine contained in the hernial sac, and from its spreading into the abdominal cavity. It is in proportion to their violence, that we ought to urge the performance of the operation. Mr. A. Cooper considers pain on pressing the belly, and tension, as the symptoms, which point out its immediate necessity. He adds, "Indeed, there is scarcely any period of the symptoms, which should forbid the operation; for, even if mortification has actually begun, the operation may be the means of saving life, by promoting the ready separation of gangrenous parts." (*On Inguinal and Congenital Hernia, p.* 27.)

Whenever the surgeon has succeeded in reducing the parts, without having recourse to the knife, if the symptoms of pain, inflammation, &c. ran high before such reduction, they will not always cease immediately afterwards. As they probably depend on the reduced bowel having been inflamed by the stricture, the body should be kept open, and the diet and regimen should be low and sparing, while the least degree of pain and tension remain; in short, till all complaint is absolutely removed from the abdomen, and the intestines do their office freely, and without trouble. (*Pott.*)

### PROGRESS OF THE SYMPTOMS OF A STRANGULATED HERNIA.

The earliest symptoms have been already related, viz. "tumour in the groin, or scrotum, attended with pain, not only in the part, but all over the belly, and creating a sickness and inclination to vomit, suppression of stools, and some degree of fever. These are the first symptoms, and, if they are not appeased by the return of the intestine, that is, if the attempts, made for this purpose, do not succeed; the sickness becomes more troublesome, the vomiting more frequent, the pain more intense, the tension of the belly greater, the fever higher, and a general restlessness come on, which is very terrible to bear. When this is the state of the patient, no time is to be lost; a very little delay is now of the utmost consequence, and if the one single remedy which the disease is now capable of be not administered immediately, it will generally baffle every other attempt. This remedy is the operation, whereby the parts engaged in the stricture may be set free. If this be not now performed, the vomiting is soon exchanged for a convulsive hiccough, and a frequent gulping up of bilious matter; the tension of the belly, the restlessness and fever having been considerably increased for a few hours, the patient suddenly becomes perfectly easy, the belly subsides, the pulse from having been hard, full, and frequent, becomes low, languid, and generally interrupted; and the skin, especially that of the limbs, cold and moist; the eyes have now a languor and a glassiness, a lacklustre not easy to be described; the tumour of the part disappears, and the skin covering it, sometimes changes its natural colour for a livid hue; but whether it keeps or loses its colour, it has an emphysematous feel, a crepitus to the touch, which will easily be conceived by all who have attended to it, but is not so easy to convey an idea of by words: this crepitus is the too sure indicator of gangrenous mischief within. In this state, the gut either goes up spontaneously, or is returned with the smallest degree of pressure; a discharge is made by stool, and the patient is generally much pleased at the ease he finds; but this pleasure is of short duration, for the hiccough and the cold sweats continuing and increasing, with the addition of spasmodic rigors and subsultus tendinum, the tragedy soon finishes." (*Pott.*)

### ANATOMY OF THE BUBONOCELE, OR INGUINAL HERNIA.

This subject must necessarily precede the account of the operation, which would otherwise be unintelligible. It is chiefly in the anatomical information, relative to herniæ, and the mode of operating, that modern surgeons have a decided superiority over their predecessors; for, before Gimbernat, Camper, Hey, Lawrence, Cooper, Scarpa, and Hesselbach, published their several works on herniæ, the anatomy of the disease was only imperfectly understood.

The tendinous fibres of the aponeurosis of the external oblique muscle, as they run downwards and forwards towards the pubes, separate from each other, so as to leave a triangular opening, called the abdominal ring. The upper and inner pillar (as it is termed) of this aperture is inserted into the symphysis of the pubes; the lower and outer one, which is only the continuation of Poupart's ligament, is fixed into the angle and crista of the same bone. Some tendinous fibres cross the upper and outer angle of the ring, so as to diminish the triangular appearance of the whole aperture: these are said to be very strong in old herniæ. The anterior and thicker layer of the aponeurosis of the internal oblique muscle joins the tendon of the external oblique; the posterior and thinner one joins that of the transversalis; but the lower portion of this tendon, together with the corresponding part of the transversalis, goes wholly in front of the rectus muscle. Thus the inferior border of the obliquus internus and transversalis, which originates from the upper part of Poupart's ligament, lies behind the outer pillar of the abdominal ring. Mr. A. Cooper was the first, who noticed, that a thin fascia proceeded from the inner edge of Poupart's ligament, and spread itself over the posterior surface of the transversalis. This forms the only partition between the peritoneum and the outer opening of the abdominal ring, and were it not for its existence, inguinal herniæ would probably be much more frequent.

The spermatic vessels, joined by the vas deferens, proceed before the epigastric artery, very near the place where it arises. They then run through the above fascia, go under the edge of the internal oblique and transverse muscles, and next obliquely downwards, and forwards, between the above fascia, and aponeurosis of the external oblique to the opening of the ring.

Thus we see, that the spermatic cord runs through a kind of canal, before it actually emerges at what is named the abdominal ring. This oblique passage of the cord, through the abdominal parietes, was well known to, and elegantly delineated by Albinus; Gimbernat makes distinct mention of it in his *Account of a new Method of Operating for Femoral Hernia, p.* 19—32; but, no one, before Mr. A. Cooper, considered the thing with due attention.

The abdominal ring is then only the outer opening of the canal, or passage, through which the spermatic cord passes before it emerges. The inner one, at which the viscera in cases of inguinal hernia first protrude, is situated about an inch and a half from the abdominal ring, in the direction towards the anterior superior spinous process of the ilium. This inner opening is rather nearer the pubes, than the ilium, and its upper border is formed by the lower edge of the internal, oblique, and transverse muscles, which can be plainly felt with the finger, introduced upward and outward into the abdominal ring.

"The precise point, at which the hernia most commonly begins, (says Scarpa) is that which corresponds, in the fœtus, to the communication of the tunica vaginalis with the peritoneum, and, in the adult, to the passage of the spermatic cord under the transverse muscle. In the sound state, the peritoneum presents at this part a small funnel-like depression, the depth of which increases in proportion as the spermatic cord is pulled from above downwards. It is this small pouch, this sort of digital appendage, whose progressive developement constitutes the hernial sac. Resting upon the anterior surface of the spermatic cord, it first makes its appearance under the inferior edge of the transverse muscle; thence it extends itself in the separation of the inferior fleshy fibres of the internal oblique muscle, always following the spermatic cord, in front of which it is situated; and after having in this manner passed through the whole of the canal, which extends from the iliac region to the pubes, it lastly protrudes at its external orifice, which is the inguinal (or abdominal) ring properly so called. In all this track, the hernial sac, as well as the spermatic cord, is situated above the femoral arch, the direction of which it follows. The canal, which it traverses, is of a conical shape, the apex of which is towards the flank, and the base at the external orifice of the ring." (*Scarpa, Traité des Hernies, p.* 44, 45.)

The epigastric artery runs behind the spermatic cord, along the inner margin of the internal opening of the above canal, then upwards and inwards, so as to pass at the distance of half an inch, or an inch from the upper extremity of the outer opening, or abdominal ring.

In common cases of inguinal hernia, the viscera, protruded at the inner opening, above described, lie over the spermatic cord, and form a tumour on the outside of the abdominal ring. They may, however, insinuate themselves into the inner opening, without descending sufficiently to protrude through the external one, or abdominal ring. The stricture may take place at either of these openings. In recent and small hernia, according to Mr. A. Cooper, the strangulation is most frequently situated at the inner opening; in large old ruptures, at the abdominal ring. Even when the parts are completely protruded out of the latter opening, the strangulation may exist at the inner one: but, there may occasionally be two strictures, viz. one at each opening. (See *Lawrence on Ruptures, p.* 183, *Edit.* 3.)

The hernial sac descends through the abdominal ring over the spermatic cord, and is covered by a fascia, sent off from the tendon of the external oblique muscle. Beneath this fascia, the cremaster muscle is also situated over the sac. When this has descended a certain way, it lies on the tunica vaginalis, as well as the spermatic cord.

As the epigastric artery naturally runs first behind the spermatic cord, and then along the inner margin of the internal opening of the ring, and as the viscera are protruded over the cord, they must be situated on the outer side of the artery, which runs first behind the neck of the sac, and then on its inner side. Hence, the inner margin of the sac, when inspected on the side towards the abdomen, seems to be formed, as it were, by the track of the vessel. (See *Lawrence*, p. 179.) That this is the ordinary situation of the epigastric artery, in relation to the inguinal hernia, is confirmed by the concurrent testimonies of Camper, Chopart, Desault, Sabatier, A. Cooper, Hesselbach, Scarpa, &c. and by preparations to be seen in almost every museum.

In recent inguinal herniæ, the internal and external openings of the ring are at some distance from each other, the first being situated obliquely upwards and outwards in relation to the former; but, the pressure of the protruded viscera, gradually brings them nearer together, so that in large herniæ of long standing, the opening into the abdomen is almost direct, and the epigastric artery becomes situated nearer the pubes, than in the natural state.

Though such is the ordinary direction, in which a bubonocele protrudes, there are occasional varieties. In one of these, the viscera, instead of descending through the canal of the ring, are at once thrust through the abdominal ring itself, and the opening into the belly is then direct: the hernial sac, instead of passing on the external side of the spermatic vessels, as is usual, now lies on their inner, or pubic side; and the episgastric artery, which is commonly situated behind, now pursues its course, in front of the sac, at its usual distance from the upper and outer angle of the abdominal ring.

The following is Scarpa's description of the displacement of the epigastric artery in the greater number of cases of inguinal hernia. "This artery, which, in the natural state, runs about ten lines from the abdominal ring, has its situation and direction so changed, in subjects affected with hernia, that it crosses the posterior part of the neck of the hernial sac, and is pushed from the outer to the inner side of the abdominal ring. In order to comprehend the reason of this displacement, it is necessary to recollect what I have elsewhere said of the formation of inguinal hernia, and of the manner, in which the spermatic cord crosses the epigastric artery. The hernia begins to form at the very place, where the spermatic cord passes under the inferior margin of the transverse muscle; and this place is rather nearer the flank, than that where the epigastric artery passes towards the rectus muscle. In its progressive developement, the hernial sac constantly follows the same track as the spermatic cord, since it is situated upon its anterior surface. As has been already explained, this cord crosses the epigastric artery; consequently, the hernial sac must necessarily pass with the cord above this artery, before protruding from the canal of the abdominal ring. At the same time, the internal orifice of the hernia becoming larger, and the inguinal canal shortened by the approximation of its two orifices to each other, it follows, that, at the period, when the hernia begins to make its appearance in the groin, the epigastric artery is unavoidably situated behind the neck of the hernial sac, and is pushed from the outer to the inner side of the ring. Let us suppose a piece of string to be passed from the inside of the abdomen into the scrotum, all through the inguinal canal, and the middle of the hernia; and that this string is pulled so as to bring the internal orifice of the hernia, which is situated beyond the point where the spermatic cord crosses the epigastric artery; this artery will immediately be found to be carried from the outer to the inner side of the neck of the hernial sac. The same thing happens from the effect of the developement of the hernia. The removal of the epigastric artery from one side of the ring to the other (says Scarpa) is a phenomenon, which may be regarded as almost constant in the inguinal hernia. I have examined the bodies of a great number of subjects, affected with this species of hernia; and it has been only in a very few, that I met with the epigastric artery retaining its natural situation on the outer side of the abdominal ring. In investigating the reason of this exception, I have observed, in all the individuals who presented it, a very remarkable weakness and flaccidity of that part of the abdominal parietes, which extends from the flank to the pubes. In all the displaced viscera had passed through the aponeuroses of the transverse and internal oblique muscles, not in the vicinity of the ilium, as is commonly the case, but, at a little distance from the pubes, giving to the upper pillar of the ring a curvature that is extraordinary, and disproportioned to the smallness of the hernia. I observed, also, that the neck of the hernial sac did not pass in an oblique direction from the flank to the pubes, but, that it protruded from the abdomen almost in a direct line from behind forwards. In short, in these individuals, the small cul-de-sac of the peritoneum, which constitutes the origin of the hernial sac, had not begun to be formed under the edge of the transverse muscle, at the point where the spermatic cord runs outward; but, it had passed through the aponeuroses of the internal oblique and transverse muscles, at a little distance from the pubes, and within the point, at which the spermatic cord crosses the epigastric artery. The small hernial sac, having at this part come into contact with and united to the spermatic cord protrudes at the external orifice of the inguinal canal, without displacing the epigastric artery from its natural situation.

"This species of hernia, properly speaking, is a mixture of the ventral and inguinal. It resembles the former, inasmuch as the hernial sac pierces the aponeuroses of the transverse and internal oblique muscles; the latter, inasmuch as it passes out at the abdominal ring, conjointly with the spermatic cord." (*Scarpa, Traité des Hernies, p.* 68, *&c.*) In most instances, the spermatic cord lies behind or under the hernial sac. There are cases, however, in which the vas deferens is found on the outer side of the sac, while the rest of the spermatic cord lies, as it usually does, on the inner side, or rather under this part. (*Cooper.*) Le Dran, Schmucker, and Blizard, have found the whole cord situated in front of the sac. Sometimes the vas deferens has run on the front and inner part, and the rest of the cord on the back and external part of the swelling. (*Camper, Hey.*) The cord has been known to be before, and the vas deferens behind the sac. (*Camper, Cooper.*)

Upon this part of the subject, the reader may deem the following passage interesting. "While the hernia is of moderate size (says Scarpa) the surrounding cellular substance is not very greatly compressed, and no change is observed in the situation of the spermatic vessels. The artery and veins of this name always form, with the vas deferens, one single cord, which is intimately adherent to the posterior surface of the hernial sac. But, in proportion as the tumour increases in size, the cellular substance, which immediately surrounds it and unites it to the spermatic cord, is more and more distended and compressed. At length, at a certain period, the distention is carried to such a pitch, that the spermatic vessels are separated from one another, and change their position with respect to the hernial sac. This kind of gradual decomposition of the spermatic cord is quite similar to that, which would be produced by pulling the surrounding cellular substance in two opposite directions. Such is the reason, why, in scrotal hernia of large size, the spermatic artery, the vas deferens, and the spermatic veins are found separated upon the posterior surface of the sac. All these vessels, instead of being conjoined in one cord, are divided by interspaces, which are sometimes very considerable. Ordinarily, the vas deferens is less separated from the spermatic artery, than from the vein of this name. In some subjects, Camper has seen it situated on one side of the sac, and the artery and veins on the other. (*Icones Herniarum, tab.* 5. *L. O. Tab.* 8. 1. 2.) The displacement and decomposition of the spermatic cord take place equally in adults and in children affected with large scrotal herniæ. (*Camper, loco cit.*) In general, towards the upper part and neck of the hernia, the vessels are not much separated; but, as they proceed downwards, they diverge more and more. Sometimes, when the hernia is very old and voluminous, they are no longer found at the posterior part, but rather at the sides, and even on the front surface of the sac; they shew themselves through the cremaster muscle, which covers them, and form a sort of vascular train, which arrests the hand of the operator at the moment, when he is about to open the hernial sac. Le Dran relates, that, in operating upon a large scrotal hernia, he found the spermatic cord on the anterior surface of the hernial sac. (*Operations de Chir. p.* 127.) This fact has been the cause of numerous conjectures, and appeared altogether inconceivable to such surgeons, as have not been acquainted with the changes, to which the spermatic cord is exposed, in cases of large scrotal herniæ. (Lassus, Med. Operat. Tom. 1, p. 152, cannot conceive the possibility of the occurrence.) The observation of Le Dran is not the less true and exact: it exemplifies a very important fact, of which it is easy to give a true explanation, when the state of the spermatic cord in ordinary inguinal herniæ, and in those, which have obtained a considerable size, has been comparatively examined. In the first, the spermatic cord quite entire is always found situated on the posterior surface of the hernial sac; but, in the second, the spermatic vessels are so separated from one another, that they sometimes extend over the sides and even the forepart of the hernial sac." (*Scarpa, Traité des Hernies, p.* 61, *&c.*)

The hernial sac is commonly described

as an elongation of peritonæum. When more minutely examined, however, it is found, in cases of inguinal hernia, to consist of the portion of peritonæum, pushed out with the viscera; of a layer of cellular substance on the outside of this, which becomes more or less thickened by the pressure of the rupture in different cases; of a fascia, sent off from the tendon of the external oblique muscle; and of the cremaster muscle, which latter parts form the exterior covering, which consisting of several layers, often leads the operator to fancy he has opened into the cavity of the sac, when, in reality, he has not.

It is observed by Professor Scarpa, that "the cremaster muscle, in cases of old large scrotal herniæ, acquires a thickness, which is really surprising. Its fibres, which are naturally very thin, become from four to six times more considerable. Being spread over the neck and body of the hernial sac, they sometimes present a remarkable consistence, and a yellowish colour. Such alteration, however, does not prevent the muscular texture from being discovered, and Haller was not mistaken about it. (*Opusc. Patholog. p.* 317.) Pathology furnishes us with several examples of similar changes of organization. In certain cases, the muscular coat of the bladder, that of the stomach and intestines, and even the exceedingly delicate fleshy fibres of the ligaments of the colon, are found to have become yellow, and much thickened.

"In old scrotal herniæ (says Scarpa) it is not unusual to find an intimate adhesion of the fibres of the cremaster muscle to the edges of the abdominal ring. This may depend on the pressure, which the contents of the hernia may make on those edges, and perhaps it may also depend on the union of the cremaster muscle with the prolongation of the aponeurosis of the fascia lata, which is continued from the margins of the ring to the groin and scrotum. Howsoever it may be, certain it is, that in old large scrotal herniæ, there is much difficulty in introducing a probe between the fleshy fibres of the cremaster and the margin of the abdominal ring; and that, on the contrary, in recent herniæ, a probe passes as easily between the edges of the ring and the cremaster, as between this muscle and the hernial sac.

"Few authors (according to Scarpa) have spoken of the sheath, formed by the cremaster muscle, in which are enclosed the hernial sac, the spermatic cord, and the tunica vaginalis of the testicle. Sharp (in *Critical Enquiry*) and Monro, the father, (*Anat. and Chirurg. Works, p.* 553.) were the first to dwell upon this important pathological point. Monro had seen the cremaster muscle covering the hernial sac; but, he did not believe, that the same thing occurred in all individuals affected with inguinal hernia. In this respect, he was mistaken; for, this disposition of the cremaster muscle is one of the essential characters of the disease. Petit has not omitted to describe the relations, which exist between the cremaster and the hernial sac. (*Œuvres Posthum. Tom.* 1, *p.* 288.) On this subject, he even relates an interesting fact, from which it results, that, in certain cases, this muscle may by its contractions alone cause a reduction of the hernia. Gunz explains, with tolerable perspicuity, how the cremaster and its aponeurosis form one of the coverings of the inguinal and scrotal hernia. (*Libellus de Herniis, p.* 50.) Morgagni once saw its fleshy fibres extended over the hernial sac; (*De sed. et caus. morb. epist.* 34, *art.* 9; *epist.* 31, *art.* 15) and Neubaver positively assures us, that he has made the same remark upon the dead body of a man affected with an entero-epiplocele. (*Dissert. de Epiploo-oscheocele.*) After these facts, so positive and accurately observed, I cannot comprehend (says Scarpa) how in our time Pott, Richter, and several other authors, should have passed over in silence, or only mentioned vaguely, this point, so important in the history of the inguinal and scrotal hernia." (*Scarpa, Traité des Hernies, p.* 48—50.)

When surgeons speak of a hernial sac being usually thicker and stronger, in proportion to the magnitude and duration of the hernia, their language is not at all correct; for, in fact, the peritoneal investment of the hernia is seldom, or never, thus altered. I can declare (says Scarpa) after numerous observations, that, in the majority of cases; the hernial sac, strictly so called, is not perceptibly thickened, and that in general it does not differ from other parts of the peritoneum, however large and old the scrotal hernia may be. (*Traité des Hernies, p.* 53.)

In a very enormous hernia, the pressure of the contents is so great, that, instead of thickening the sac, it renders it thinner, and even makes it ulcerate. The protruded viscera have been met with immediately beneath the integuments, when the sac has been burst by a blow. (*Cooper; J. L. Petit.*)

The outer surface of the peritoneal part of the hernial sac, is always most closely adherent to the other more external covering by means of cellular substance. This connexion is formed so soon, after the first occurrence of a hernia, that any hopes of returning a hernial sac into the abdomen are now generally considered as merely chimerical. There must, however, be a certain space of time, before adhesions form, though it is, no doubt, exceedingly short.

Upon this point, Scarpa does not adopt the opinion commonly received.

"It has long been disputed, (observes

this author) whether it is possible to reduce a hernial sac into the abdomen with the intestine. But, it has happened, as in most discussions, that every one has endeavoured rather to support his own opinion, than appreciate the facts opposed to him. On both sides, they have neglected to consult observation, which alone ought to be the basis of our judgment in similar matters.

"There is no doubt, that in recent and small inguinal herniæ, the intestine, strangulated by the neck of the hernial sac, has been known, in more instances than one, to have been reduced by the taxis, and carried with it the whole of the sac into the abdomen. Observations, not less authentic, inform us, that, after the operation for hernia, when the viscera could not be reduced on account of their adhesions to the sac, they have been seen, notwithstanding such adhesions, to get nearer to the ring daily, and at length, spontaneously to return into the belly together with the hernial sac. Louis was wrong in denying the possibility of these facts. (*Acad. Royale de Chirurgie, Tom.* 11, *p.* 486.) For my part, (continues Scarpa) I regard them as very correct, according to my own experience, and that of several other surgeons. It appears, that the illustrious secretary of the academy, only refused to put confidence in such well-attested cases, because they were contrary to an opinion, that he had set up with great assurance: he pretended that neither art, nor nature, could ever accomplish the reduction of the hernial sac, unless the cellular substance, which unites it to the spermatic cord and surrounding parts, were torn. Apparently he forgot, that, under certain circumstances, the cellular substance will bear, without laceration, a considerable elongation, and afterwards shrink again. It is thus, that we often see a viscus, which has suffered a considerable displacement, return spontaneously into its natural situation. Pathology would furnish us with a great number of similar examples; but, not to depart from our subject, daily experience proves, that, in the inguinal hernia, the spermatic cord is elongated, and descends farther, than in the natural state. No laceration of the cellular substance, however, is then occasioned; for, if the hernia be kept reduced, the spermatic cord becomes shorter, daily retracts, and at last has only the same length, which it had previously to the disease. When a sarcocele becomes large and heavy, the portion of the spermatic cord, naturally situated within the belly, is by degrees drawn out into the scrotum; but, after the tumour is extirpated, this portion ascends again, and of itself returns into its original situation.

"The same thing happens after the operation for the strangulated inguinal hernia. All practitioners have noticed that the hernial sac retracts and reascends progressively towards the ring. That alone would prove, that the cellular substance, which surrounds the spermatic cord, and unites it to the hernial sac, is highly endued with the property of yielding, and afterwards returning to its original state. Can the same property be refused to the cellular substance, which unites the sac to the cremaster muscle and other surrounding parts?

"While the inguinal hernia is recent, and not of much size, the cellular substance in question, possesses all its elasticity, and hence, the hernial sac and the spermatic cord, may easily ascend towards the abdominal ring. I have had occasion (says Scarpa) to make this observation upon the dead body of a man, who had an incipient inguinal hernia. The small hernial sac was capable of being pushed back into the ring with the utmost facility; and in carefully examining the parts, both within and without the belly, it appeared to me, that the cellular substance, which united the sac to the spermatic cord and cremaster muscle, was disposed to yield equally from without inwards, and in the direction precisely opposite; that is to say, it made an equal resistance to the protrusion and the reduction of the hernial sac. Monteggia has seen a case exactly similar: although, according to his own expressions, (*Instituz. Chirurg. Tom.* 3, *sez.* 2, *p.* 249,) the hernial sac was not very small, it adhered very loosely to the surrounding parts, and it admitted of being entirely reduced into the abdomen with great facility. It might indeed be strictly said, that this is not a true reduction, because in pushing back the hernial sac, we only just squeeze it up behind the ring, whence it is forced out again by the slightest effort. But, whatever we may please to term this *retrocession* of the hernial sac, it is not the less proved, in an evident manner, that, in the small and recent inguinal hernia, the hernial sac, together with the viscera which it contains, may be returned into the abdomen.

"This is not the case with large old scrotal herniæ. In these, the cellular substance, which unites the sac to the spermatic cord, and cremaster muscle, has acquired such a density, that it does not oppose less resistance to the further developement of the hernia, than to the efforts of the surgeon, who endeavours to effect its reduction." (*Scarpa, Traité des Hernies, p.* 57, *&c.*)

We shall conclude this anatomical account of the inguinal hernia, with the following explanation of the parts as they appear on dissection: "the removal of the integuments exposes the exterior investment of the hernial tumour, continuous with the margins of the ring, and formed of tendinous fibres, from the aponeurosis, the cremaster muscle, &c. This is connected by cellular substance with the proper hernial sac, formed of the peritonæum. This production of the peritonæum passes through the ring of the external oblique, and then goes upwards and outwards. Behind and above the ring, the inferior margin of the obliquus internus and transversalis crosses the neck of the sac. When these muscles are reflected towards the linea alba, the fascia, ascending from Poupart's ligament, and forming the upper opening of the ring, is exposed, and the epigastric artery is discovered emerging from the inner side of the neck of the hernial sac, (*Camperi Icones, Tab. X. F. M.*) which, at this precise point, becomes continuous with the peritonæum, lining the abdomen. The removal of the hernial sac will disclose the course of the spermatic cord in its descent towards the testicle; and when this is also elevated, the first part of the course of the epigastric artery, and its origin from the iliac trunk, are exposed." (*Lawrence on Hernia, p.* 182, *Edit.* 3.)

In females, the round ligament of the uterus bears the same relation to the tumour, as the spermatic cord in males. In the former subjects, bubonoceles are uncommon. Mr. Lawrence had a very rare instance pointed out to him, in which a bubonocele in a female was situated on the inner side of the epigastric artery.

### MARKS OF DISCRIMINATION BETWEEN SOME OTHER DISEASES AND INGUINAL HERNIÆ.

The disorders in which a mistake may possibly be made, are the *Cirsocele, Bubo, Hydrocele,* and *Hernia Humoralis,* or *Inflamed Testicle.*

For an account of the manner of distinguishing the first complaint from a bubonocele, see *Cirsocele.*

"The circumscribed incompressible hardness, the situation of the tumour, and its being free from all connexion with the spermatic process, will sufficiently point out the first, at least while it is in a recent state; and when it is in any degree suppurated, he must have a very small share of the *tactus eruditus,* who cannot feel the difference between matter, and either a piece of intestine, or omentum.

"The perfect equality of the whole tumour, the freedom and smallness of the spermatic process above it, the power of feeling the spermatic vessels and the vas deferens in that process, its being void of pain upon being handled, the fluctuation of the water, the gradual formation of the swelling, its having begun below and proceeded upwards, its not being affected by any posture or action of the patient, nor increased by his coughing or sneezing, together with the absolute impossibility of feeling the testicle at the bottom of the scrotum, will always, to an intelligent person, prove the disease to be a hydrocele." Mr. Pott, however, allows, that there are some exceptions, in which the testicle cannot be felt at the bottom of the scrotum in cases of hernia. "In recent bubonoceles, while the hernial sac is thin, has not been long, or very much distended, and the scrotum still preserves a regularity of figure, the testicle may almost always be easily felt at the inferior and posterior part of the tumour. But, in old ruptures, which have been long down, in which the quantity of contents is large, the sac considerably thickened, and the scrotum of an irregular figure, the testicle frequently cannot be felt, neither is it in general easily felt in the *congenital hernia* for obvious reasons." (*Pott.*)

"In the *hernia humoralis,* the pain in the testicle, its enlargement, the hardened state of the epidydimis, and the exemption of the spermatic cord from all unnatural fulness, are such marks as cannot easily be mistaken; not to mention the generally preceding gonorrhœa. But, if any doubt still remains of the true nature of the disease, the progress of it from above downward, its different state and size in different postures, particularly lying and standing, together with its descent and ascent, will, if duly attended to, put it out of all doubt, that the tumour is a *true hernia.*" (*Pott.*)

When an inguinal hernia does not descend through the abdominal ring, but only into the canal for the spermatic cord, it is covered by the aponeurosis of the external oblique muscle, and the swelling is small and undefined.

Now and then, the testicle does not descend into the scrotum till a late period. The first appearance of this body at the ring, in order to get into its natural situation, might be mistaken for that of a hernia, were the surgeon not to pay attention to the absence of the testicle from the scrotum, and the peculiar sensation occasioned by pressing the swelling.

### OPERATION FOR THE STRANGULATED INGUINAL HERNIA, OR BUBONOCELE.

This consists in dividing the integuments; dissecting down to the sac, and opening it; removing the stricture; and replacing the protruded viscera.

The external incision should begin an inch above the external angle of the ring, and extend over the middle of the tumour to its lower part. The advantage of beginning the wound so high, is to obtain convenient room for the incision of the stricture. By this first cut, the external pudic branch of the femoral artery may be divided; it crosses the hernial sac near the abdominal ring, and sometimes bleeds so freely, that it should be immediately tied. In general, however, a ligature is unnecessary.

When carrying this incision low down, we should always bear in mind the caution given by Camper, that there is a possibility of dividing the spermatic vessels, should they happen to be situated, as they sometimes are, in front of the hernia. The division of the integuments brings into view the fascia, which is sent off from the tendon of the external oblique muscle, and covers the hernial sac.

The layers of tendinous fibres, cellular substance, &c. intervening between the skin and sac, should be carefully divided, one after another, with the knife and dissecting forceps, taking care to incline the edge of the instrument horizontally, for fear of cutting too deeply at once, and injuring the viscera contained in the sac.

After making a small opening through a part of the fascia covering the sac, some advise introducing a director, and laying it open upward and downward as far as the tumour extends. The same manner of proceeding, they next recommend in regard to the cremaster muscle. Thus the sac becomes completely exposed. When this method is followed, Mr. A. Cooper advises the incisions not to be carried upward, nearer, than one inch, to the abdominal ring, for reasons which will be presently explained.

However it may be rationally doubted, whether there is any good in these regular and successive divisions of the whole length of the coverings of the sac; and it is certain, that they protract the operation very much. As the grand object, after dividing the skin, is to make a small opening into the sac, sufficient for the introduction of a director, dissecting down at one particular place, answers every purpose, and enables us, in the end, to lay open the whole of the sac and its coverings in the shortest time. Let the operator only take care to raise the successive layers of fibres with the forceps, and divide the apex of each elevated portion with the knife held horizontally. As there is commonly a quantity of fluid in the sac, and it gravitates to the lower part, to which place the intestine seldom quite descends; this is certainly the safest situation for making the first opening into the sac. The operator, however, relying on the presence of such fluid, should not cut too boldly: sometimes none at all is found, and the viscera are in immediate contact with, nay, adherent to, the inner surface of the sac.

The circular arrangement of the vessels of a piece of intestine, and its smooth polished surface, sufficiently distinguish it from the hernial sac, which has a rough cellular surface, and is always connected with the surrounding parts, although these adhesions, in a very recent case, may be but slight. (*Lawrence on Ruptures, p.* 214, *Edit.* 3.)

We have mentioned, that Mr. A. Cooper only advises cutting the fascia, and other coverings of the sac, under the skin, to within an inch of the abdominal ring: he also recommends, of course, limiting the division of the sac itself to the same extent. His reasons, for this practice, are to avoid making the closure of the wound more difficult, and to lessen the danger of peritoneal inflammation.

Having laid open the hernial sac, with a probe-pointed bistoury, guided on a director, or the fore-finger, introduced into the opening, which is made at the lower part of the sac, the next desideratum is to divide the stricture, unless the viscera admit of being easily reduced, without such an incision being made, as occasionally happens.

From the anatomical account, which we have given of the bubonocele, it appears, that the stricture may either be situated at the abdominal ring, and be formed by the margins of this opening, or else at the inner aperture of the canal, about one inch and a half, in a direction upward and outward, from the outer opening in the tendon of the external oblique muscle. This latter strangulation is caused by the semicircular edge of the transversalis muscle and its tendon, which pass over the neck of the hernial sac, and by a fascia, arising from Poupart's ligament, the semicircular border of which passes under this part of the sac.

The common, and probably the best, practice is to divide the hernial sac, together with the stricture. When this is situated at the abdominal ring, the surgeon is to introduce the end of a director a little way into the neck of the sac, within the aperture in the tendon, and with a probe-pointed bistoury, guided on the latter instrument, *he is to cut the stricture upward and outward, or else directly upward*; a manner, which Mr. A. Cooper recommends because it is applicable to all cases, even those less frequent ones, in which the hernia protrudes on the inner side of the epigastric artery. This vessel, as we have already explained, commonly runs upward round the inner side of the neck of the sac; so that cutting the stricture upward and inward would be very apt to divide it.

Cutting upward and outward is, in ordinary cases, perfectly safe; and is only objectionable in a few occasional instances, in which the hernia descends on the inner side of the artery. Mr. A.

Cooper's rule of always cutting in one direction, viz. upward, which is proper in every instance, is in my opinion well worthy of universal adoption. The safety and propriety of this method are strikingly illustrated by what Scarpa observes: he states, that the right direction of the incision of the ring is directly upwards, parallel to the linea alba. "I have (says he) operated in the way which I recommend, upon several dead subjects, who had either external, or internal inguinal herniæ, directing my incision in the course of a line drawn from the upper part of the ring parallel to the linea alba; in all, I constantly left the epigastric artery untouched, even when I extended the cut about an inch above the inguinal ring." (*Scarpa, Traité Pratique des Hernies, p.* 111.) No more of the parts, forming the stricture, should be cut, than is just sufficient for allowing the protruded viscera to be reduced, without bruising, or otherwise hurting them. The middle of the upper margin of the ring is the safest place for making the necessary incision.

Mr. A. Cooper, in his late work on the Inguinal Hernia, advises a mode of dividing the stricture, considerably different from the usual method. He directs the finger of the operator to be introduced into the sac, (which in his plan, we know is left undivided for the space of one inch below the ring.) When the stricture is felt, a probe-pointed bistoury is to be conveyed over the front of the sac into the ring (between the two parts), and the latter only is then to be divided, in the direction upward, opposite the middle of the neck of the sac, and to an extent just sufficient to allow the protruded parts to be returned into the abdomen, without their being hurt. The two chief advantages, which Mr. A. Cooper imputes to this method, are, that the danger of peritoneal inflammation will be less, and that the epigastric artery, if wounded, would not bleed into the abdomen. I am of opinion, that what Mr. Lawrence has remarked, concerning this proposal, is exceedingly judicious: "An accurate comparative trial of both methods would be necessary, in order to determine the weight of the first reason. The second circumstance cannot be a matter of any importance, if we cut in such a direction as to avoid the risk of wounding the artery. Many circumstances present themselves as objections to this proposal. The manœuvre itself, although perhaps easy to the experienced hand of such an able anatomist as Mr. C., would, I am convinced, be found highly difficult, if not impracticable, by the generality of surgeons. This difficulty arises from the firm manner, in which the sac and surrounding parts are connected, we might almost say, consolidated together. The experience of Richter (*Traité des Hernies, p.* 118) shews, that this objection is founded in reality. He once tried to divide the ring, without cutting the sac, but he found it impracticable. If the stricture is so tight, as to prevent the introduction of the finger, there must be great danger of wounding the protruded parts. The practice would still be not advisable, even if it could be rendered as easy as the common method of operating. Mr. C. leaves an inch of the sac, below the ring, undivided; thus a bag remains ready to receive any future protrusion, and the chance of a radical cure is diminished. It would be better to follow the advice of Richter, and scarify the neck of the sac, in order to promote an adhesion of its sides. He has found this practice so successful in accomplishing a radical cure, that he advises (*p.* 191.) its employment in every operation for strangulated hernia." (*See Lawrence on Ruptures, p.* 231, *Edit.* 3.)

If the stricture should be felt to exist at the inner opening of the canal for the spermatic cord, Mr. A. Cooper advises the operator to introduce his finger into the sac, as far as the stricture, and then to insinuate a probe-pointed bistoury, with the flat part of its blade turned towards the finger, between the front of the sac and the abdominal ring, till it arrives under the stricture, formed by the lower edge of the transversalis and obliquus internus. Then the edge of the instrument is to be turned forward, and the stricture cut in the direction upward. This plan of not cutting the neck of the sac, is liable to all the objections stated by Mr. Lawrence, in regard to the case, in which the strangulation takes place at the abdominal ring. It should be mentioned, that Mr. A. Cooper's bistoury is a very proper one for dividing the stricture, as it only has a cutting edge to a certain distance from the point. Perhaps, on the whole, we may infer, that it is both most easy and advantageous to divide the neck of the sac, together with the stricture, whether this be situated at the ring, or more inward. In the latter case, cutting upward and outward would always be perfectly safe, because the hernia always protrudes on the outer side of the epigastric artery; but, as it is easiest for the memory to adhere to one rule, making the incision immediately upward is a very proper plan.

Room being made for the reduction of the protruded parts into the abdomen, by the division of the stricture, they are to be immediately returned, if sound, and free from adhesions. This object is considerably facilitated by bending the thigh. The intestines are to be reduced before the omentum, but, when a portion of mesentery is protruded, it is to be returned before either of the preceding parts. The intestine should always be reduced, unless it be found in a state of actual mortification. It often appears so altered in colour, that an uninformed person would deem it improper to return it into the abdomen. However, if such alteration should not amount to a real mortification, experience justifies the reduction of the part. Mr. A. Cooper has judiciously cautioned the operator not to mistake the dark chocolate-brown discolorations, for a state of gangrene. With these the protruded part is frequently found affected; and, as they generally produce no permanent mischief, they ought to be carefully discriminated from the black-purple, or lead-coloured spots, which usually precede mortification. To determine whether a discoloured portion of intestine be positively mortified, some recommend pressing forward the blood contained in the veins, and, if they fill again, it is looked upon as a proof, that the bowel is still possessed of life.

In returning a piece of intestine into the abdomen, the surgeon should first introduce the part, nearest the ring, into this aperture, and hold it there till another portion has succeeded it. This method is to be followed up, till the whole of the protruded bowel is reduced.

Writers on surgery cannot too severely reprobate the employment of any force, or violence, in endeavouring to return the contents of a hernia in the operation: a method the more pernicious, because such parts are commonly more or less in a state of inflammation. It is always more judicious to enlarge the stricture, than to pinch and bruise the bowel in trying to get it through an opening which is too small. Distention of the intestine sometimes prevents the reduction: but, the bowel can then be generally returned as soon as its contents have been compressed into the part of the intestinal canal within the stricture. It is better, however, to dilate the strangulation a little more, than to use any force in trying to get the intestine back into the abdomen in the manner just suggested.

Reduction is sometimes impeded by the protruded parts adhering to each other, or to the hernial sac. The intestines are not often found very firmly adherent together. The omentum and inside of the sac are the parts, which are most subject to become intimately connected by adhesions. The fingers will commonly serve for breaking any recent slight adhesions which may have taken place between the intestines and inside of the hernial sac. When those adhesions are firm, and of long standing, they must be cautiously divided with the knife; an object, which can be most easily and safely accomplished, in case they are long enough to permit the intestine to be elevated a little way from the surface of the sac. But, provided their firmness and shortness keep the external coat of the bowel and inner surface of the sac in close contact, the greatest care is requisite in separating the parts with a knife, so as to avoid wounding the intestine. In doing this, the most prudent and safe method, is not to cut too near the bowel, but rather to remove the adherent parts of the sac, and return them with the intestine into the abdomen. Every preternatural connexion should always be separated, before the viscera are reduced: Mr. A. Cooper mentions, that a fatal obstruction to the passage of the intestinal matter has arisen from the mere adhesion of the two sides of a fold of intestine together. (*P.* 31.) When the adhesions, which prevent reduction, are situated about the neck of the sac, so as to be out of the operator's view, it is best to make the wound through the skin and abdominal ring somewhat larger, so as to be able to separate the adhesions with more safety.

Having reduced the parts, the operator should introduce his finger, for the purpose of being sure that they are fairly and freely returned into the abdomen, and no longer suffer constriction, either from the inner opening, from the ring, or the parts just within the cavity of the peritonæum.

### TREATMENT OF THE OMENTUM.

In an entero-epiplocele, this part, if healthy and free from gangrene, is to be reduced after the intestine. When, however, it is much diseased, thickened, and indurated, as it frequently is found to be, after remaining any considerable time in a hernial sac, the morbid part should be cut off. Its reduction, in this circumstance, would be highly improper, both because an immoderate enlargement of the wound would be necessary, in order to be able to put the diseased mass back into the abdomen, and because, when reduced, it would, in all probability, excite inflammation of the surrounding parts, and bring on dangerous symptoms. (See *Hey, p.* 172.)

The diseased omentum should always be cut off with a knife; and, if any of its arteries should bleed, they ought to be taken up with a tenaculum, and tied separately with a small ligature. An unreasonable apprehension of hemorrhage from the cut end of the omentum has led many operators to put a ligature all round this part, just above the diseased portion, which they were about to remove. This practice cannot be reprobated in terms too severe; for, a frequent effect of it is to bring on a fatal inflammation, and even mortification of the omentum, extending within the abdomen, as high as the stomach and transverse arch of the colon. Mr. A. Cooper has remarked with great truth, that it is surprising, this custom should ever have prevailed. The very object of the operation is to extricate the omentum from its strangulated state, arising from the pressure of the surrounding tendon, and no sooner has this been done, than the surgeon includes it in a ligature, which produces a more perfect constriction, than that which existed before the operation was undertaken.

"When the omentum has suffered strangulation for a few days (says Mr. Lawrence,) it often becomes of a dark red, or livid colour; and there is an appearance, on cutting it, as if some blood were extravasated in its substance. This, I believe, is the state, which surgeons have generally described under the term of gangrene." (*P.* 262.)

When cut in this state, it does not bleed. I need hardly observe, that the dead part must be amputated, and never reduced. Some have advised leaving the omentum in the wound, especially in cases of old herniæ, in which it has been a long while protruded. Hey mentions cases, shewing that granulations form very well, and that the wound becomes firmly healed, when this plan is followed. (*P.* 180, *&c.*) Every one, however, will acknowledge the truth of what Mr. Lawrence says on this subject. The method "is attended with no particular advantage, but certainly exposes the patient to the possibility of ill consequences. The omentum, left in the wound, must be liable to injury, inflammation, or disease; and hence arises a source of danger to the patient. Unnatural adhesions, formed by this part, have greatly impaired the functions of the stomach. Cases are recorded, where the unfortunate patient has never been able to take more than a certain quantity of food, without bringing on instant vomiting: and even where it has been necessary for all the meals to be taken in the recumbent position, with the trunk curved, and the thighs bent. (*Gunz.*) To avoid the possibility of such afflicting consequences, we should, after removing any diseased portion, carefully replace the sound part of the omentum in the abdominal cavity." (See *Lawrence on Ruptures, p.* 274, *Edit.* 3.)

### TREATMENT, WHEN THE INTESTINE IN THE SAC IS MORTIFIED.

Sometimes, on opening the hernial sac, the intestine is found to be in a gangrenous state, although the occurrence could not be previously known, owing to the integuments and the hernial sac itself not being affected with the same mischief. In ordinary cases, however, both the skin and sac become gangrenous at the same time with the contents of the hernia. The tumour, which was previously tense and elastic, becomes soft, doughy, emphysematous, and of a purple colour. Sometimes the parts also now spontaneously return; but, the patient only survives a few hours.

Mr. A. Cooper has accurately remarked, that, in other instances, the skin, covering the swelling, sloughs to a considerable extent, the intestine gives way, and, as the feces find vent at the wound, the symptoms of strangulation soon subside. When the patient continues to live in these circumstances, the living part of the intestine becomes adherent to the hernial sac, the sloughs separate and come away, and thus an artificial anus is established, through which the feces are commonly discharged, during the remainder of life. (See *Anus, Artificial.*)

However, though when the patient survives the mortification of an intestinal hernia, he commonly obtains the blessings of life only combined with the loathsome affliction of an artificial anus; yet, things sometimes take a still more prosperous course; the feces gradually resume their former route to the rectum, and, in proportion as the artificial anus becomes unnecessary, it is shut up. Many instances of this sort have fallen under my own observation in St. Bartholomew's hospital. The chance of a favourable event is much greater in some kinds of hernia, than in others. When the strangulation only includes a part of the diameter of the gut, the feces are sometimes only partially discharged through the mortified opening. This quantity lessens, as the wound heals, and the patient gets perfectly well. (*Louis; Mem. de l'Acad. de Chir. Tom.* 3.) A small gangrenous spot, or two, may end in the same manner. Mortification, as well as wounds of the large intestines, is much more frequently followed by a recovery, than the same affection and similar injuries of the small intestines. Mortification of the cæcum and its appendix, in a hernial sac, has happened several times, without materially disturbing the usual course of the feces to the anus, and the patients have very soon recovered. (*Med. Obs. and Inq. Vol.* 3, *p.* 162; *Hey's Pract. Obs. p.* 162, *&c.*)

The grand thing, on which the establishment of the continuous state of the intestinal canal depends, in all these cases, is the adhesion, which the living portion of the bowel, adjoining the mortified part, contracts with the peritonæum all round. In this manner, the escape of the contents of the bowels into the cavity of the peritonæum becomes in general completely prevented. The two ends of the sound portion of intestine, after the mortified part has separated, open into a membranous cavity, which previously constituted a portion of the peritoneal sac, and now unites the extremities of the gut. The gradual contraction of the wound closes the membranous cavity externally, and thus the continuity of the canal is restored. The two ends, however, are not joined so as to form a continued cylindrical tube, like that of the natural gut; but, they are united at an angle more, or less acute, and the matters, which go from one to the other, describe a half circle in a newly formed membranous cavity that completes the canal. (See *Lawrence on Ruptures*, *p.* 280, *Edit.* 3.)

It is an observation of Mr. A. Cooper's, that the degree of danger, attending an artificial anus, depends on the vicinity of the sphacelated part of the intestinal canal to the stomach. Thus, if the opening be in the jejunum, there is such a small extent of surface for absorption, between it and the stomach, that the patient dies of inanition.

Let us now suppose, that the mortified state of the intestine has only been discovered, after laying open the hernial sac in the operation. The mischief may only consist of one, or more spots; or of the whole diameter of the protruded bowel. In the first case, the proper practice is to divide the stricture, and return the intestine into the abdomen, with the mortified spots towards the wound. Mild purgatives and glysters are then to be exhibited. The most favourable mode, in which a case of this kind ends, is, when the intestinal matter gradually resumes its natural course, after being either partly or entirely discharged from the wound. But, sometimes, the patient sinks under the disease, or an artificial anus continues for life.

The repeated observations of modern surgeons have now decided, that no ligature, passed through the mesentery, to keep the gangrenous part of the bowel near the wound, is at all necessary. The parts, in the neighbourhood of the ring, have all become adherent together, in consequence of inflammation, at the same time, that the parts in the hernial sac mortify; and, of course, the partially gangrenous bowel, when reduced, is mechanically hindered, by these adhesions, from slipping far from the wound. Desault and De la Faye, both confirm the fact, that the intestine never recedes far from the ring; and, even were it to do so, the adhesions, which it soon contracts to the adjacent surfaces, would, as Petit has explained,' completely circumscribe any matter, which might be effused, and hinder it from being extensively extravasated among the convolutions of the viscera. (*Mem. de l'Acad. de Chir. Tom.* 1 *and* 2.)

Where the chief part, or whole of the diameter of the protruded bowel is mortified, the first and most urgent indication is to relieve the bad symptoms arising from the distention of the intestinal canal above the stricture. "Let a free incision (says Mr. Lawrence) be made through the mortified part of the gut, in order to procure that evacuation of the loaded canal, which nature attempts by the process of gangrene." If the intestine has already given way, a free division of the integuments and sac allows the exit of the accumulated matters; and the opening in the gut may be enlarged, if necessary. (*Lawrence, p.* 283.)

Here the division of the stricture is unnecessary, since all the mischief, which the bowel can receive from it, is done. This subject is fully explained by Mr. Travers. (See *Enq. into the Process of Nature in Repairing Injuries of the Intestines, &c. p.* 300, *&c.*) Mild purgatives and clysters will be proper to unload the bowels, and determine the course of the feces towards the anus. Should, however, the stricture appear after the mortification to impede the free escape of the intestinal contents, a moderate dilatation of it must undoubtedly be proper.

Mr. Lawrence, in his valuable Treatise on Ruptures, has clearly shewn the impropriety of sewing the ends of the intestinal canal together, introducing one within the other, supported by a cylinder of isinglass, &c. put in their cavity, in those cases, in which the whole circle of the intestine has mortified, and been cut away, as is advised by the majority of writers. By drawing the intestine out of the cavity, in order to remove the dead part, the adhesion behind the ring, on which the prospect of a cure chiefly depends, must be entirely destroyed; and new irritation and inflammation must be unavoidably produced, by handling and sewing an inflamed part. (See *Lawrence on Ruptures, p.* 298, *&c.*)

Instead of such practice, this gentleman very judiciously recommends dilating the stricture, and leaving the subsequent progress of the cure entirely to nature. The sloughs will cast off, and the ends of the gut are retained by the adhesive process in a state of apposition to each other, the most favourable for their union. Thus, there is a chance of the continuity of the intestinal canal becoming established again.

However, in recent wounds of the abdomen, attended with a protrusion of a portion of the intestine, cut completely across, the bowel is as yet neither inflamed, nor adherent to the vicinity of the wound in the peritonæum, so that, in these cases, it may be proper practice to connect the ends together, (as advised in speaking of *Wounds of the Intestines*,) by means of a few stitches with silk, or thread, and a small sewing needle; and to confine the wounded part of the intestine, near the breach in the peritonæum, until adhesions have had time to form.

Mr. A. Cooper has recommended this mode of proceeding in cases of hernia, attended with mortification of the whole diameter of the bowel; but, for reasons already stated, and many facts, referred to in Mr. Lawrence's work, it is to be hoped, that the plan of sewing the intestines in these cases will be for ever abandoned.

### OPERATION FOR VERY LARGE INGUINAL HERNIÆ.

When the tumour is of very long standing, is exceedingly large, perhaps extending half way down to the knees, and its contents have never admitted of being completely reduced, the indication is to divide the stricture, provided a strangulation takes place; but without laying open the hernial sac, or attempting to reduce the parts.

The reasons, against the common plan of operating, under such circumstances, are, the difficulty of separating all the old adhesions; the hazardous inflammation, which would be excited by laying open so vast a tumour, and the probability that parts, so long protruded, might even bring on serious complaints, if reduced. J. L. Petit, and afterwards, Dr. Monro, advised the sac not to be opened in operating on certain cases. (See *Mal. Chir. Tom. 2, p.* 372. *Description of Bursæ Mucosæ.*)

### OPERATION FOR THE HERNIA, WHEN IT IS SO SMALL THAT IT DOES NOT PROTRUDE EXTERNALLY THROUGH THE RING.

In this kind of case, there is little appearance of external tumour; consequently, the disease is very apt to be overlooked by the patient and surgeon, and some other cause assigned for the series of symptoms. The manner of operating, in this form of the disease, differs from that in the common scrotal hernia; the incision is to be made parallel to the direction of the spermatic cord, and the stricture will be found at the internal ring. (*A. Cooper on Inguinal Hernia.*)

### TREATMENT AFTER THE OPERATION.

Evacuations from the bowels should be immediately promoted by means of glysters, oleum ricini, or small doses of any of the common salts, dissolved in peppermint-water. For some time, the patient must only be allowed a low diet. When symptoms of inflammation of the bowels and peritonæum threaten the patient, general bleeding, leeches applied to the abdomen, fomentations, the warm bath, blisters, doses of the oleum ricini, and glysters, are the means deserving of most dependence, and should be resorted to, without the least delay. When all the danger of peritoneal inflammation is past, and the patient is very low and weak, bark, wine, cordials, and a generous diet, must be directed. The effervescing saline draught, with opium, is the best medicine for quieting sickness, after the operation. Opium and cordials are the most eligible for checking diarrhœa. As the operation does not usually prevent the parts from becoming protruded again, a truss must be applied before the patient leaves his bed, and afterwards constantly worn.

### PROPOSALS FOR THE RADICAL CURE OF THE BUBONOCELE.

We shall just mention the principal plans for this purpose; some of them are perfectly absurd and cruel; others may deserve more extensive trial. Of castrating the patient, applying caustic, or of the operation of the punctum aureum, with this view, I need only say, that they are barbarous, and not at all adapted for the attainment of the desired end. A description of these methods may be found in Paré, Wiseman, &c.

The old operation, termed the *royal stitch*, seems one of the most justifiable. It consisted in putting a ligature, under the neck of the hernial sac, close to the abdominal ring, and then tying it, so as to produce an obliteration of the pervious state of the part, by the adhesive inflammation thus excited. An incision, about two inches long, would be quite large enough for getting at the neck of the sac, which must next be separated from the parts covering it on each side, with a few sweeps of the knife. A single ligature might then, with the aid of a needle, be passed immediately under it, and between it and the spermatic vessels, close to the ring, and then firmly tied, just as surgeons tie an artery. This operation is applicable to reducible hernia. One would not expect *à priori*, that any dangerous constitutional symptoms would be likely to follow so small a wound, or making a ligature on a part of such little importance as a hernial sac. After performing the common operation for the relief of a strangulated bubonocele, might not this opportunity be taken to learn whether a radical cure would not more frequently be accomplished, than is at present the case?

The royal stitch, performed in this manner, has been actually attended with success. (*Heister, Vol. 2.*) The umbilical rupture was cured by Saviard, on similar principles; and Desault radically cured nine cases of the exomphalos in children, by tying the hernial sac.

Schmucker cured two irreducible ruptures, free from strangulation, by cutting away the body of the sac, after tying its neck. (*Chirurgische Wahrnehnumgen, Vol. 2.*) In one case, Mr. A. Cooper found, cutting away the sac alone insufficient.

Dissecting away the whole hernial sac, or even laying it open, must be a formidable operation, compared with the simple mode above related. Such severe proceedings would also be quite useless, if the hernia were reducible, and the neck of the sac could be rendered impervious by the ligature. Perhaps, the cases recorded by Petit, Sharp, Acrell, &c. against attempting a radical cure, have no real validity against the royal stitch done in the simple way above described, as none of these surgeons operated in this manner.

Richter recommends scarifying the neck of the sac, with a view of producing an adhesion of its sides to each other; a plan which, he says, he has found very successful. It certainly seems free from danger; but, perhaps, not more so than tying the part; and, one would expect, less likely to be always successful.

From the account, however, which we have given of the anatomy of the bubonocele, it is obvious, that all these methods could only obliterate the sac as high as the ring, not more inwardly to the inner opening. Hence, there would still remain a certain portion of the entrance of its cavity open for the descent of the viscera.

### CRURAL, OR FEMORAL HERNIA.

Verheyen, who wrote in 1710, first demonstrated the distinct formation of crural hernia, which was before generally confounded with bubonocele.

The parts composing this kind of hernia, are always protruded under Poupart's ligament, and the swelling is situated towards the inner part of the bend of the thigh. The rupture descends on the inside of the femoral artery and vein, between these vessels and the os pubis. Females are particularly subject to this kind of rupture, in consequence of the great breadth of their pelvis, while in them the inguinal hernia is rare. It has been computed, that nineteen out of twenty married women, afflicted with hernia, have this kind; but, that not one out of a hundred unmarried females, or out of the same number of men, have this form of the disease. (*Arnaud.*)

"The crural hernia," says Scarpa, "is frequently observed in women, who have had several children; it very seldom afflicts young girls; and still more rarely men. In the latter, the viscera can more easily escape through the inguinal ring, by following the spermatic cord, than they can descend along the crural vessels, and raise the margin of the aponeurosis of the external oblique muscle, that forms the crural arch. In women, an opposite disposition prevails, in consequence of the smallness of the inguinal ring, which, in them, only gives passage to the round ligament of the uterus, and besides is situated lower down, and nearer the pubes, than it is in men, whilst on the contrary, the crural arch is more extensive, by reason of the wider form of the pelvis. Morgagni expressly says, that he has never met with the crural hernia in the dead body of any male subject. *Mihi ut verum fatear, nondum nisi in fœminis accidit ut eam viderem.* (*De Sed. et caus. morb. Epist.* 34—15.) Camper gives us to understand almost the same thing. (*Icones Herniarum, in Præfat.*) Hévin often operated for this kind of hernia in females, but only once in the male subject. (*Pathol. et Therap. p.* 406.) Sandifort and Walter have both seen but a single instance of it in the dead body of the male subject. (*Obs. Anat. Pathol. cap.* 4, *p.* 72. *Sylloge comment. anat. p.* 24, *obs.* 21.) Arnaud himself, to whom modern surgery is highly indebted for many important precepts on the operation for the strangulated crural hernia in both sexes, candidly confesses, that he never had an opportunity of dissecting a hernia of this kind in the male subject." (*Scarpa, Traité des Hernies, p.* 201.)

Scarpa happened to have at his disposal the dead body of a man affected with a crural hernia, and, he availed himself of the opportunity of examining the parts with the utmost care. He first injected the blood-vessels; he afterwards attentively dissected all the parts concerned in the disease; and he has published an exact description of all the particulars, accompanied with an engraving. Plate 8.

A singular case has been lately published, in which an inguinal and femoral hernia were met with together in a gentleman 63 years of age. On examination of the body after death, an inguinal rupture was discovered, and concealed by it, and under a load of fat, a small piece of intestine was found strangulated by the femoral ligament. (See *Charles Bell's Surgical Observations, Part* 2, *p.* 187.)

But, though the occasional occurrence of the crural hernia in men is fully proved, it is chiefly in women, that this form of disease is met with.

According to the observations of Scarpa, and all the best modern writers upon surgery, the crural hernia forms, both in the male and female subject, in the cellular substance, which accompanies the crural vessels below Poupart's ligament. The swelling follows the internal side of those vessels, and gradually descends into the fold of the thigh, between the sartorius, gracilis, and pectineus muscles. "Many surgeons believe, (says Scarpa,) that the hernial sac, and the intestines, which it contains, are ordinarily situated above the crural vessels and trunk of the vena saphena, and sometimes between these vessels and the anterior superior spine of the ilium. But, as far as my knowledge extends, this assertion is not supported by a single accurate description of a crural hernia in the early stage. It is true, that when the tumour has in time acquired a large size, and its fundus is inclined in a parallel manner to the fold of the thigh, it partly or entirely covers the crural vessels, and even the crural nerve, as Walter says he once observed. (*Sylloge comment. anat. p.* 24.) But, it is not thence to be concluded, that the tumour in the beginning descended over the crural vessels, much less betwixt them and the anterior superior spinous process of the ilium. Neither must it be imagined, that the neck of the hernial sac becomes removed from the inner to the outer side of these vessels. If these two cases ever happen, they must be very rare; and the best authors, who have treated of the crural hernia, concur in stating, that in performing the operation, they have constantly found the viscera situated on the inside of the crural vessels, but never on their outside. Even when the tumour, after acquiring a considerable size, was situated transversely over the crural vessels, the neck of the hernial sac has always been found upon their inner side, that is to say, between them and the pubes. Le Dran, (*Observ. de Chir. Tom.* 2, *p.* 2.), La Faye, (*Cours d'Opérations de Dionis, p.* 358.), Petit, (*Œuvres Posthumes, Tom.* 2, *p.* 219.), Morgagni, (*De Sed. et Caus. Morb. epist.* 34—15.), Arnaud, (*Mem. de Chir. Tom.* 2, *p.* 768.), Gunz, (*De Herniis libellus, p.* 78.), Bertrandi, (*Trattato delle Operazioni, Tom.* 1, *annot. p.* 218,), Pott, (*Chirurg. Works, Vol.* 2, *p.* 152), Desault, (*Traité des Mal. Chirurg. p.* 191—195), B. Bell, (*A System of Surgery, Vol.* 1, *p.* 387), Richter, (*Traité des Hernies, chap.* 34), Nessi, (*Institut. Chirurg. Tom.* 2, *p.* 198), Lassus, (*Med. Oper. Tom.* 1, *p.* 198), and many other writers, all concur upon this point. In support of their opinion (says Scarpa) I could cite a great number of cases of my own, which I have collected either in operating on several individuals for crural hernia, or in dissecting the same kind of hernia in the bodies of many female subjects, and in that of the man, from whom I have taken the plate. Lastly, also, having had an opportunity of dissecting in a female an enormous crural hernia, which descended one-third of the way down the thigh, I observed, that the neck of the sac did not encroach at all upon the crural vessels, but lay entirely on their inner side." (*Scarpa, Traité des Hernies, p.* 203—206.)

The situation of the tumour makes it liable to be mistaken for an enlarged inguinal gland; and many fatal events are recorded to have happened from the surgeon's ignorance of the existence of the disease. Mr. Lawrence once saw an hospital surgeon mistake a crural hernia for a glandular tumour, and the patient died, without any attempt being made to afford relief by the operation. (*P.* 391, See also *Petit's Traité des Mal. Chir. Tom.* 2, *p.* 293, *&c.*) A gland can only become enlarged by the gradual effects of inflammation; the swelling of a crural hernia comes on in a momentary and sudden manner, and, when strangulated, occasions the train of symptoms already described in our account of the inguinal hernia, which symptoms an enlarged gland could never occasion. Such circumstances seem to be sufficiently discriminative; though the feel of the two kinds of swelling, is often not of itself enough to make the surgeon decided in his opinion. A femoral hernia may be mistaken for a bubonocele, when the expanded part of the swelling lies over Poupart's ligament. As the taxis and operation for the first case ought to be done differently from those for the latter, the error may lead to very bad consequences. The femoral hernia, however, may always be discriminated, by the neck of the tumour having Poupart's ligament above it. In the bubonocele, the spine of the pubes is behind and below this part of the sac; but, in the femoral hernia, it is on the same horizontal level, and a little on the inside of it. (See *Lawrence on Ruptures, p.* 392—393, *Edit.* 3.)

In the male subject, "the crural hernia, in the early stage, (says Scarpa) is situated so deeply in the bend of the thigh, that it is difficult, even in the thinnest persons, to feel its neck, and in examining its circumference with the extremity of the finger, the tendinous margin of the opening, through which the parts are protruded, can only be perceived with considerable difficulty. On the contrary, the inguinal hernia, however small it may be, is always less deeply situated; it is about half an inch above the bend of the thigh. In carrying the finger round its neck, the tendinous margin of the inguinal ring can be easily felt at its circumference; and at the posterior part of the small tumour, the cord composed of the spermatic vessels is distinguishable. When the crural hernia has acquired a considerable size, its neck is always deeply situated in the bend of the thigh; but, its body and its fundus have assumed an oval form, and their great diameter is situated transversely in the bend of the thigh. Whatever may be the size of the inguinal hernia, it always presents a tumour of a pyramidal form, the base or fundus of which, far from being directed towards the ilium, follows exactly the direction of the spermatic cord, and descends directly into the scrotum. It may also be added, that, besides the symptoms, common to all hernial swellings, the crural hernia, when it has attained a certain size, presents some others, which are peculiar to it, such as a sense of stupor and heaviness in the thigh, and œdema of the leg, and even of the foot, of the same side.

"In women, however, it is less easy to distinguish the crural hernia from the inguinal. In fact, the absence of the spermatic cord, and the nearer situation of the ring to the crural arch, may easily occasion a mistake. Sometimes, a woman may even be supposed to have a double crural hernia of the same side, whilst, of these two distinct, though neighbouring herniæ, one may be inguinal, and the other crural. Arnaud (*Mém. de Chir. Tom. 2, p.* 605,) relates an instance of such a mistake." (*Scarpa, Traité des Hernies, p.* 207—208.)

This interesting writer takes occasion to observe further, upon this part of the subject, that the portion of the inferior pillar of the abdominal ring, which separates this opening from the internal and inferior angle of the crural arch, is so slender in women, that it is sometimes hard to distinguish the crural from the inguinal hernia, which is not the case in male patients.

Until very lately, the stricture, in cases of femoral hernia, was always supposed to be produced by the lower border of the external oblique muscle, or, as it is termed, Poupart's ligament. A total change of surgical opinion on this subject, has, however, latterly taken place, in consequence of the accurate observations first made in 1768, by Gimbernat, surgeon to the king of Spain. "In the crural hernia, (says he) the aperture through which the parts issue, is *not* formed by two bands, (as in the inguinal hernia) but it is a foramen almost round, proceeding from the internal margin of the crural arch (Poupart's ligament), near its insertion into the branch of the os pubis, between this bone and the iliac vein; so that, in this hernia, the branch of the os pubis is situated more internally than the intestine, and a little behind; the vein, externally, and behind; and the internal border of the arch, before. Now it is this border which always forms the strangulation." (See *A new Method of Operating for the Femoral Hernia, by Don Antonio de Gimbernat, p.* 6. *Trans. by Beddoes.*)

Mr. Hey, in the first edition of his Practical Observations, attempted to explain some anatomical circumstances relative to the part causing the stricture in femoral herniæ, and proposed calling it the *femoral ligament.* But, in consequence of certain objections being made to his explanation by Mr. Lawrence, this term was withdrawn from the last edition of the above excellent practical work. Mr. Lawrence makes the ligament described by Gimbernat, perfectly intelligible, in a few words: when Poupart's ligament approaches the pubes, he states that it becomes suddenly broader; that it is fixed by this broad portion, along the whole length of the angle and crista of the pubes; that it has a rounded and strong anterior edge, a thin and sharp posterior margin; and that the former of these is nearer to the surface, while the latter is comparatively deeply seated. The breadth of this part varies, in different subjects: it is generally from three quarters of an inch to an inch. Sometimes, as Gimbernat has stated, it measures more than an inch. Dr. Monro has observed, that it is broader in the male than in the female subject; and, from this structure, he explains in part the more rare occurrence of this rupture in the male." (*P.* 368, *Edit.* 3.)

The great utility of knowing, that it is this part, which produces the strangulation, in cases of femoral hernia, is immense; for we then know, that cutting the lower and outer border of the external oblique muscle, (in other words, Poupart's ligament) is quite erroneous. This proceeding is the more to be reprobated, because the lower pillar of the abdominal ring, in both sexes, will be divided by directing the incision upward, or upward and inward; and thus the abdominal and crural rings, are made into one common aperture, large enough to make the future occurrence of hernia very likely to happen. In the male, also, there is considerable danger of the spermatic cord being cut. Cutting Poupart's ligament obliquely outwards, is attended with still more danger; for the epigastric artery will be infallibly divided at its origin: With all these hazards, the cutting of Poupart's ligament is quite useless, unless the incision be carried on to the internal edge of the crural arch. (*Gimbernat, p.* 16.)

Mr. B. Bell has the merit of having proposed the safest plan of cutting Poupart's ligament, before surgeons were aware of the part which really formed the strangulation: he introduced his finger below Poupart's ligament, between the ligament and the intestine, (an evident proof, says Gimbernat, very truly, that there was no strangulation there;) he then made a very superficial incision from above downwards, into the thickest part of the ligament to its lower edge; and, without cutting quite through it, he continued his incision about an inch. He rested the back of the scalpel upon his finger, which served as a guide to the instrument, and, at the same time, as a defence to the intestine. The incision, however, having been continued for an inch, would, as Gimbernat remarks, inevitably cut the internal edge of the crural arch. Now, cutting this, only for a few lines, gives sufficient room for the easy reduction of the parts, and there is no necessity to touch the ligament, as it never occasions the strangulation.—(*Gimbernat, p.* 27.)

The iliacus internus muscle is covered by a thin fascia, called by Mr. A. Cooper, *fascia iliaca.* This is closely connected with the tendon of the psoas parvus, and is inserted into the posterior edge of Poupart's ligament, as far as where the crural vessels pass under this part. It is this fascia which prevents any protrusion of the viscera, on the outside of these vessels. But between the iliac vein, the thin posterior, deep-seated, edge of Poupart's ligament, and the os pubis, a space exists, at which the femoral hernia makes its descent. Sometimes, at this point is situated a lymphatic gland; sometimes only cellular substance.

According to Mr. Lawrence, "the fascia lata, or fascia of the thigh, has two distinct insertions at the upper and anterior part of the limb. It is attached to the front edge of the pubes, over the origin of the pectineus, the fibres of which it closely covers, and it is also fixed to the front of the crural arch. The former of these is continuous, behind the femoral vessels, with the iliac fascia: the latter is not inserted along the whole length of the tendon, its attachment ceasing on the inner side of the vessels, which it covers anteriorly. Here, therefore, the femoral artery and vein are interposed between the two divisions." (*On Ruptures, Edit.* 3, *p.* 371.)

Where the insertion of the fascia lata into Poupart's ligament ends, it forms what Mr. Burns of Glasgow calls the *falciform process,* the upper part of which is attached to the above ligament, while the lower proceeds further down the thigh. Its convexity faces the pubes. This anatomical connexion is one chief cause, why extending the thigh, and rotating it outward, should make the crural arch tense.

Gimbernat named the place where the femoral hernia protrudes the *crural;* Hey, the *femoral ring.*

The hernia, being situated in front of the pectineus, must of course be exterior to the fascia lata. In my opinion, surgeons are very much indebted to Mr. Lawrence for his able explanation of this fact. As for myself, I am candid enough to own that, until I read his clear and concise account of the anatomy of the crural hernia, I could never reap any accurate notions, concerning the relative situations of the hernial sac and fascia of the thigh, from other more prolix works. This gentleman reminds us, however, that the particular crural hernia, contained in the sheath of the femoral vessels, lies under the fascia; *p.* 382, *Edit.* 3. Mr. Lawrence mentions, that, "the falciform process of the fascia lata, passes along the upper and outer part of the tumour. The iliac vein is placed on the outer side of the neck of the sac; the pubes is directly behind it; and the upper and inner parts are bounded by the thin posterior edge of Poupart's ligament." The falciform process seems to have some inferior share in producing the strangulation; the chief part of which is formed, as Gimbernat first pointed out, by the thin posterior edge of the crural arch.

The sac of the femoral hernia is exceedingly narrow at its neck; and, where its body begins, it becomes expanded in a globular form: the sac of the bubonocele is generally of an oblong shape. The body of the sac of the femoral hernia, makes a right angle with the neck, by being thrown forward and upward, a circumstance very necessary to be known in trying to reduce the parts by the taxis.

The sac of the femoral hernia is covered by a kind of membranous expansion, consisting of condensed cellular substance, and named by Mr. A. Cooper, the *fascia propria.* According to this gentleman, another covering extends over the swelling, from the superficial fascia of the bend of the thigh. It is of infinite use to remember these circumstances in operating, lest one should think the hernial sac divided, when it is not so.

All late writers on hernia, have remarked how very small the aperture is, through which the viscera protrude in the femoral rupture; how much greater the constriction generally is, than in the bubonocele; consequently, how much more rapid the symptoms are; how much less frequently the taxis succeeds; and how much more dangerous delay proves. (See *A. Cooper, Hey, Lawrence, &c.*)

Though the crural ring is almost always very small, yet in a few instances, in which the tumour is very large, and of long standing, it becomes very capacious, just as the opening often becomes, through which the inguinal hernia protrudes. Dr. Thomson, of Edinburgh, Mr. Hey, and Mr. Lawrence, have related examples of this kind.

The remarks already made, concerning the treatment of hernia, before having recourse to the knife, are all applicable to the present case, and we need not repeat them. In attempting to reduce the femoral hernia by the taxis, the surgeon should recollect, however, that relaxing Poupart's ligament, and the femoral fascia, is of the highest consequence. Hence, the thigh should be bent, and rolled inwards. The pressure ought also to be first made downwards and backwards, in order to push the swelling off Poupart's ligament; and afterwards, the parts should be propelled upwards, so as to try to get them through the crural ring.

### OPERATION FOR THE FEMORAL, OR CRURAL HERNIA.

Mr. A. Cooper says, "the incision of the integuments is to be begun an inch and a half above the crural arch, in a line with the middle of the tumour, and extended downwards to the centre of the tumour below the arch. A second incision, nearly at right angles with the other, is next made, beginning from the middle of the inner side of the tumour, and extending it across to the outer side, so that the form of this double incision will be that of the letter T reversed." The angular flaps are, of course, to be next dissected off, and reflected.

The making of two incisions, however, is not deemed necessary by the majority of surgeons; and, in all the numerous operations which I have seen performed by the surgeons in St. Bartholomew's Hospital, during a space of nearly fifteen years, I never knew them have occasion to make any transverse wound. The division of the skin should begin about an inch above the crural ring, and be continued obliquely downwards and outwards. In this manner, we cut exactly over the place, where the incision of the stricture should be made.

"The first incision (says Mr. A. Cooper) exposes the superficial fascia, which is given off by the external oblique muscle, and which covers the anterior part of the hernial sac; but, if the patient is thin, and the hernia has not been long formed, this fascia escapes observation, as it is then slight and delicate, and adheres closely to the inner side of the skin. When this fascia is divided, the tumour is so far exposed, that the circumscribed form of the hernia may be distinctly seen; and a person, not well acquainted with the anatomy of the parts, would readily suppose that the sac itself was now laid bare. This, however, is not the case, for it is still enveloped by a membrane, which is the fascia, that the hernial sac pushes before it, as it passes through the inner side of the crural sheath. This membrane, the fascia propria, is to be next divided longitudinally from the neck to the fundus of the sac; and if the subject is fat, an adipose membrane lies between it and the sac, from which it may be distinguished by seeing the cellular membrane passing from its inner side to the surface of the sac.

"This is, in my opinion, the most difficult part of the operation; for the fascia propria is very liable to be mistaken for the sac itself; so that, when it is divided, it is supposed that the sac is exposed, and the intestine is laid bare; following upon this idea, the stricture is divided in the outer part of the sac, and the intestine, still strangulated, is pushed, with the unopened sac, into the cavity of the abdomen.

"The hernial sac being exposed, is to be next opened; and, to divide it with safety, it is best to pinch up a small part of it between the finger and thumb; to move the thumb upon the finger, by which the intestine is distinctly felt, and may be separated from the inner side of the sac; and then to cut into the sac, by placing the blade of the knife horizontally. Into this opening, a director should be passed, and the sac opened from its fundus to the crural sheath." (*A. Cooper on Crural and Umbilical Hernia.*)

Sometimes the contents of the hernia, thus exposed, admit of being returned, without the further use of the knife. When this object, however, cannot be readily done, the protruded parts should never suffer injury in repeating manual attempts; and it is safest to divide the stricture at once.

Gimbernat's method of dividing the stricture, in cases of femoral herniæ, may be regarded as the most effectual, and safest. "Introduce, along the internal side of the intestine, a cannulated or grooved sound, with a blunt end, and a channel of sufficient depth. This is to be directed obliquely inwards, till it enter the crural ring, which will be known by the increased resistance; as also when its point rests upon the branch of the os pubis. Then suspend the introduction; and keeping the sound (with your left hand, if you are operating on the right side, and v. v.) firmly resting upon the branch of the os pubis, so that its back shall be turned towards the intestine, and its canal to the symphysis pubis, introduce gently with your other hand, into the groove of the sound, a bistoury, with a narrow blade and blunt end, till it enter the ring. Its entry will be known, as before, by a little increase of resistance. Cautiously press the bistoury to the end of the canal: and employing your two hands at once, carry both instruments close along the branch to the body of the pubis, drawing them out at the same time. By this easy operation, you will divide the internal edge of the crural arch at its extremity, and within four or five lines of its duplicature; the remainder continuing firmly attached, by the inferior band, or pillar, of which it is the continuation. This simple incision being thus made, without the smallest danger, the internal border of the arch, which forms the strangulation, will be considerably relaxed, and the parts will be reduced with the greatest ease." (*Gimbernat, p.* 45, 46.)

Mr. A. Cooper recommends the stricture to be divided "obliquely inwards and upwards, at right angles to the crural arch."

After advising us to open the sac of a femoral hernia with particular care, on account of its being much thinner than that of a bubonocele, and (as might be added) on account of its seldom containing any fluid, and often having no omentum in it covering the intestine, Mr. Hey remarks, "The stricture made upon the prolapsed parts is very great, as I have already observed; but if the tip of the finger can be introduced within the femoral ring, to guide the bubonocele knife, a small incision (for the ring is narrow) will be sufficient to set the parts at liberty. If the tip of the finger cannot be introduced at the proper place, a director with a deep groove must be used instead of the finger; but I prefer the latter. The finger, or director, should not be introduced very near the great vessels; but on that side of the intestine or omentum which is nearest to the symphysis of the ossa pubis. *The incision may then be made directly upwards.* The surgeon must take especial care to introduce his finger or director within that part where he finds the stricture to be the greatest, which, in this species of hernia, is the most interior part of the wound." (*P.* 155.)

Gimbernat's mode is preferable to Mr. Hey's, because, were the operation done on a male, cutting directly upward would endanger the spermatic cord.

Mr. Lawrence has noticed, "an incision of the most interior part of the stricture is free from all danger, in the ordinary course of the vessels. But that variety, in which the obturatrix artery, arising from the epigastric, runs along the inner margin of the sac, seems to preclude us from cutting even in this direction. A mode of operating has been lately proposed, (*Edinb. Med. and Surg. Journal, Vol.* 2, 205.) with a view of avoiding this danger. We are directed to make an incision through the aponeurosis of the external oblique muscle, just above the crural arch, and in a direction parallel to that part: to introduce a director under the stricture from this opening, and to divide the tendon to the requisite extent, by means of a curved knife, passed along the groove." (*Treatise on Ruptures, Edit.* 3, *p.* 407.) For reasons which Mr. Lawrence states, this plan is certainly not altogether eligible, and, upon the whole, Gimbernat's method of cutting the stricture is the safest. Monro computes, that the obturator artery may arise from the epigastric, once in twenty-five or thirty subjects. But, allowing that it originates more frequently, it then does not always deviate from its usual course along the outside of the sac. Mr. A. Cooper says: "in all cases, which I have myself dissected, where this variety existed with crural hernia, the obturator has passed into the pelvis, on the outer side of the neck of the sac, entirely out of the reach of any danger of the knife." (*On Crural Hernia, p.* 21.) Mr. Lawrence concludes, that the comparative number of instances, in which it is found on the opposite side, cannot be more than one in twenty, and consequently if we admit, that the obturatrix artery arises from the epigastric once in five times, it would only be liable to be wounded once in a hundred operations. (*P.* 412, *Edit.* 3.)

It is observed by professor Scarpa, that "the round ligament of the uterus, in passing through the abdominal muscles, follows precisely the same track as the spermatic cord. It is equally situated behind Poupart's ligament, with the difference, that it does not become so distinct from the internal extremity of this ligament, as the spermatic cord does, because it has not so far to run, in order to get from that ligament to the inguinal ring, the latter opening being situated lower in the female, than the male subject. The round ligament, like the spermatic cord, also crosses the epigastric artery, before reaching the inguinal ring. And as the crural hernia always begins at the internal and inferior angle of the arch of this name, as well in the male as the female, it follows, that, in the two sexes, the epigastric artery remains in its natural situation, and invariably corresponds to the external side of the neck of the crural hernia; whilst the spermatic cord, in man, and the round ligament, in women, pass over the extremity of the front of the neck of the hernial sac. In the operation for the crural hernia, in females, the incision of the neck of the hernial sac, and crural arch, when directed upward towards the linea alba, cannot wound the epigastric artery, which it is of the most consequence to avoid; but it always divides, either totally or partially, the round ligament of the uterus, which cannot lead to any dangerous hemorrhage; for, out of the period of pregnancy, the arteries of the round ligament are very small; they are almost obliterated in women advanced in years; and in general, they are quite capillary in the extremity of the ligament adjoining the ring. Hence, it cannot be surprising, that so many crural herniæ have been successfully operated upon in women, by cutting the hernial sac and crural arch directly upward, while not a single instance can be cited of such an incision being made in man without any ill consequence, although in both sexes, the epigastric artery may have been avoided in operating by this process." (*Scarpa, Traité des Hernies, p.* 240.)

In operating for the crural hernia in males, Scarpa recommends us to follow a method, which he calls new, but which in fact is the same as that advised by Gimbernat. "I have found (says Scarpa) that, in man, the neck of the hernial sac may be divided without danger, by giving to the incision a direction exactly contrary to that, which is practised, in the female subject. After having opened the hernial sac, it is to be drawn outward by one of its sides sufficiently to allow the introduction of a small director between its neck and the strangulated intestine, *the groove of the instrument being turned downwards towards the internal and inferior angle of the crural arch. A probe-pointed bistoury, the edge of which is also to be directed downwards towards the point of insertion of Poupart's ligament to the pubes, is to be pushed along the groove. By this means, the neck of the hernial sac will be divided its whole length, at its internal and inferior side, and Poupart's ligament will be cut close to its attachment to the top of the os pubis.* The epigastric artery will be certainly avoided, because it lies upon the opposite side of the hernial sac. As for the spermatic cord, I have demonstrated, that it is situated on the forepart of the neck of the hernial sac; consequently, it cannot be touched by an incision made from above downwards, whilst it is constantly cut in the ordinary method, since the knife is carried from below upwards. In the first case, this part may be the more easily avoided, as it lies at some distance from the internal and inferior angle of the crural arch. In fact, it is at this place, that it quits, as we have seen, the edge of Poupart's ligament, in order to ascend towards the inguinal ring. The incision, that I propose (says Scarpa) not only has the advantage of slitting open the neck of the hernial sac its whole length, it also divides a part of the insertion of Poupart's ligament into the upper part of the os pubis, a thing, that greatly contributes to relax the crural arch, and facilitate the reduction of the viscera; of those, at least, which are not adherent to the sac." (*Scarpa, Op. cit. p.* 235.)

Although this accurate anatomist and surgeon appears to be quite unacquainted with many of the late valuable publications on hernia, which have made their appearance in this country, it is curious to find, both in his account of the inguinal and crural hernia, how strongly his doctrines and observations tend to confirm every thing that has recently been insisted upon in modern works, respecting the place where the bubonocele first protrudes, its passing through a sort of canal before it comes out of the abdominal ring, the advantage of cutting in the crural hernia the internal and inferior angle of Poupart's ligament, or, in other terms, that part of the ligament, which was first particularly pointed out by Gimbernat, as causing the principal part of the strangulation, and about which so much has been said by Mr. A. Cooper, Mr. Hey, &c.

### CONGENITAL HERNIA.

Before the beginning of the sixth month of the fœtal state, the testicle is situated near the kidney, where it receives a covering from the peritonæum, just like the other abdominal viscera. Between the beginning of the sixth month, and end of the seventh, the testicle has either descended as low as just above the abdominal ring, or else is passing through it, or just below it. (*Wrisberg. Comm. Reg. Societ. Gotting.* 1578.)

When the testicle passes through the abdominal ring into the scrotum, it carries before it a production of the peritonæum, which afterwards constitutes the tunica vaginalis; while that peritoneal investment, which was given to the testicle in the loins, is closely adherent to this body, and forms what is named the tunica albuginea.

After the descent of the testicle into the scrotum, the communication between the cavity of the tunica vaginalis and that of the abdomen, commonly becomes obliterated, which latter event is usually effected before birth, sometimes not till afterwards, and in a few subjects, even as late as the adult state.

In the congenital hernia, the protruded viscera are situated in the tunica vaginalis, in contact with the testicle; having descended into this position before the closure of the communication with the abdomen. Of course, the tunica vaginalis itself is the hernial sac. The nature of this case was not understood, before it was elucidated by Haller in 1755, and the two Hunters in 1762 and 1764. (See *Hunter's Med. Comment.; Haller's Opuscula Patholog. and Opera Minora, Tom.* 3.) Before that period, surgeons imputed the circumstance of the contents of the hernia and testicle being in contact, to the former parts having made their way, by laceration, through the tunica vaginalis, from the ordinary hernial sac of a bubonocele. The old surgeons, indeed, frequently cite this instance, in proof of their doctrine, that some herniæ were attended with a laceration of the peritonæum. (See *Sharp's Enquiry.*)

From the term *congenital*, we might suppose that this hernia always existed at the time of birth. The protrusion, however, seldom occurs till after this period, on the operation of the usual exciting causes of herniæ in general. The congenital hernia does not usually happen till some months after birth; in some instances, not till a late period. Mr. Hey relates a case, in which a hernia congenita was first formed in a young man, aged sixteen, whose right testis had, a little while before the attack of the disease, descended into the scrotum. It seems probable, that in the cases of hernia congenita, which actually take place when the testicle descends into the scrotum before birth, the event may commonly be referred to the testicle having contracted an adhesion to a piece of intestine, or of the omentum, in its passage to the ring. Wrisberg found one testicle, which had not passed the ring, adhering, by means of a few slender filaments, to the omentum, just above this aperture, in an infant, that died a few hours after birth.

Excepting the impossibility of feeling the testicle in hernia congenita, as we can in most cases of bubonocele, (which criterion Mr. Pott should have mentioned,) the following account is very excellent. "The appearance of a hernia in very early infancy, will always make it probable that it is of this kind; but, in an adult, there is no reason for supposing his rupture to be of this sort, but his having been afflicted with it from his infancy; there is no external mark, or character, whereby it can be certainly distinguished from one contained in a common hernial sac; neither would it be of any material use in practice, if there was.

"When returnable, it ought, like all other kinds of ruptures, to be reduced, and constantly kept up by a proper bandage; and when attended with symptoms of stricture, it requires the same chirurgic assistance as the common hernia.

"In very young children, there are some circumstances, relative to this kind of rupture, which are very well worth attending to, as they may prove of very material consequence to the patient.

"A piece of intestine, or omentum, may get pretty low down in the sac, while the testicle is still in the groin, or even within the abdomen; both which I have seen. In this case, the application of a truss would be highly improper; for in the latter, it might prevent the descent of the testicle from the belly into the scrotum; in the former, it must necessarily bruise and injure it, give a great deal of unnecessary pain, and can prove of no real use. Such bandage, therefore, ought never to be applied on a rupture in an infant, unless the testicle can be fairly felt in the scrotum, after the gut or caul is replaced; and when it can be so felt, a truss can never be put on too soon.

"As this kind of rupture is subject to stricture, with all its consequences, as much as that which is contained in a common hernial sac, and therefore liable to stand in need of the chirurgic operation; it may be very well worth an operator's while to know, that an old rupture, which was originally congenital, is subject to a stricture made by the sac itself, independent of the abdominal tendon, as well as to that made by the said tendon.

"Whether this be owing to the weight of the testicle at the bottom of the sac, and the endeavours which nature makes to close the upper part of the tunica vaginalis, or to what other cause, I will not pretend to say, but the fact I have several times noticed, both in the dead and in the living. I have seen such stricture made by the sac of one of these herniæ, as produced all those bad symptoms which render the operation necessary; and I have met with two different strictures, at near an inch distance from each other, in the body of a dead boy, about fourteen, one of which begirt the intestine so tight, that I could not disengage it without dividing the sac.

"In this kind of hernia I have also more frequently found connexions and adhesions of the parts to each other, than in the common one; but there is one kind of connexion sometimes met with in the congenital hernia, which can never be found in that which is a common hernial sac, and which may require all the dexterity of an operator to set free; I mean that of the intestine with the testicle, from which I have more than once experienced a good deal of trouble.

"When a common hernial sac has been laid open, and the intestine and omentum have been replaced, there can be nothing left in it which can require particular regard from the surgeon; but by the division of the sac of a congenital hernia, the testicle is laid bare, and after the parts composing the hernia have been reduced, will require great regard and tenderness, in all the future dressings, as it is a part very irritable, and very susceptible of pain, inflammation, &c.

"If a large quantity of fluid should be collected in the sac of a congenital hernia, and, by adhesions and connexions of the parts within, the entrance into it from the abdomen should be totally closed, (a case which I have twice seen) the tightness of the tumour, the difficulty of distinguishing the testicle, and the fluctuation of the fluid, may occasion it to be mistaken for a common hydrocele; and if without attending to other circumstances, but trusting merely to the feel and look of the scrotum, a puncture be hastily made, it may create a great deal of trouble, and possibly do fatal mischief.

"By what has fallen within my observation, I am inclined to believe that the sac of a congenital hernia is very seldom, if ever, distended to the degree which a common hernial sac often is: it also, from being less dilated, and rather more confined by the upper part of the spermatic process, generally preserves a pyriform kind of figure, and, for the same reason, is also generally thinner, and will therefore require more attention and dexterity in an operator when he is to open it. To which I believe I may add, that common ruptures, or those in a common sac, are generally gradually formed, that is, they are first inguinal, and by degrees become scrotal; but the congenital are seldom, if ever, remembered by the patient to have been in the groin only." (*Pott on Ruptures, Vol.* 2.)

The reader must not conclude, however, from the above account, that every rupture in children is congenital. Mr. Lawrence has related a case of strangulated bubonocele, which took place, in an infant only fourteen months old. (*P.* 65, *Edit.* 3.)

The common inguinal hernia, which first protrudes at the inner opening of the inguinal canal, and which has the epigastric artery on the inner side of its neck, has been named by Hesselbach *external*, while the less common instance, in which the viscera pierce directly through the aponeuroses of the transverse and internal oblique muscles, and pass directly out of the abdominal ring, leaving the epigastric artery on the outer side of the neck of the sac, is distinguished by the epithet *internal*. (*Anatomisch. Chirurg. Abhandlung. uber den Ursprung der Leistenbruch.*) "The inguinal congenital hernia (says Scarpa) cannot be divided into *external* and *internal*: it is evident, that it must always be external, since the neck of the tunica vaginalis invariably corresponds to the point at which the spermatic cord passes under the margin of the transverse muscle. As for other circumstances, the tunica vaginalis lies in its whole course in the same manner as the sac of a common inguinal hernia: like this, it passes completely through the inguinal canal from one end to the other, resting upon the anterior surface of the spermatic cord. Consequently, it passes between the separation of the inferior fibres of the obliquus internus, and the principal origin of the cremaster muscle. (See *Wrisberg. sylog. comment. anat. p.* 23.) After coming out of the ring, being always united to the spermatic cord, it is enclosed in the muscular and aponeurotic sheath of the cremaster muscle, which accompanies it to the bottom of the scrotum. Since the tunica vaginalis, including the displaced viscera, enters the inguinal canal on the outside of the point, at which the spermatic cord crosses the epigastric artery, it is manifest, that, as it follows exactly the direction of this cord, it must also cross the artery, and remove it from the outer to the inner side of the ring, according to the mechanism already explained in speaking of the common inguinal hernia. Hence, the displacement of the epigastric artery constantly happens in the inguinal congenital, just as it does in the ordinary external inguinal hernia.

"But, if these two species of inguinal herniæ have some analogy to each other, in regard to the parts which constitute them, yet, they present some remarkable differences. 1. The common inguinal hernia, whether internal, or external, when it extends into the scrotum, cannot descend beyond the point at which the spermatic vessels enter the testicle. There the cellular substance of the spermatic cord terminates. There the hernial sac must unavoidably terminate. On the contrary, in the congenital hernia, the viscera may descend lower, than the testicle, with which they are in immediate contact; and, at length, they even occupy the situation of this organ, which is then pushed upward and backward. 2. In the case of a congenital hernia, the descent of the viscera from the groin to the scrotum commonly takes place in a very short time, and in some measure precipitately: it is much slower and more gradual in the ordinary inguinal hernia. The reason of this difference is very plain. In the first case, the descent of the testicle, and the formation of the tunica vaginalis, have opened and prepared the route, which the viscera must follow in forming a protrusion; while, in the second, the hernial sac cannot descend into the scrotum, but by gradually elongating the layers of the cellular substance, which joins it to the surrounding parts. This fact is so generally known, that experienced practitioners consider the promptitude with which the viscera have descended from the groin to the bottom of the scrotum, as a characteristic sign, of a scrotal congenital hernia." (*Scarpa, Traité des Hernies, p.* 73, *&c.*)

If circumstances will admit of a truss being applied and worn, in cases of congenital hernia, in young subjects, there will be a considerable chance of a radical cure being effected, in consequence of the natural propensity of the opening between the abdomen and tunica vaginalis to become closed.

The only material difference in the operation, from that for a bubonocele, is, that the surgeon has to lay open the tunica vaginalis, instead of a common hernial sac. The stricture is to be divided on the same principle as that of an inguinal hernia, and much in the same manner. As, in a case of congenital hernia, the parts are always protruded on the outside of the epigastric artery, the stricture may be safely divided towards the ileum, as well as directly upwards. (*Lawrence on Ruptures, p.* 481, *Edit.* 3.) The parts having been reduced, the edges of the wound are to be immediately brought together, and retained so by means of one or two sutures, and sticking plaster, which is much preferable to the plan of applying the dressing to the testicle and inside of the tunica vaginalis, so as to heal the part by the granulating process.

A new species of hernia congenita has lately been described, in which a common peritoneal hernial sac, containing the viscera, is included in the tunica vaginalis. It arises from the parts being protruded, after the communication, between the abdomen and tunica vaginalis, is closed, so that the peritonæum is carried down along with the intestine, and forms a hernial sac, within the tunica vaginalis. It is evident also, that such a hernia can only be produced, while the original tunica vaginalis remains, in the form of a bag, as high as the abdominal ring. Operators should be aware of the possibility of having a sac to divide, after laying open the tunica vaginalis. (See the accounts of this hernia in *Hey's Practical Observations, p.* 221, *&c. and A. Cooper's work on Inguinal Hernia, p.* 59.)

## UMBILICAL HERNIA, OR EXOMPHALOS.

" The exomphalos, or umbilical rupture, (says Pott) is so called from its situation, and has (like other herniæ) for its general contents, a portion of intestine, or omentum, or both. In old umbilical ruptures, the quantity of omentum is sometimes very great.

" Mr. Ranby says, that he found two ells and a half of intestine in one of these, with about a third part of the stomach, all adhering together.

" Mr. Gay and Mr. Nourse found the liver in the sac of an umbilical hernia; and Bohnius says that he did also.

" But whatever are the contents, they are originally contained in the sac, formed by the protrusion of the peritoneum.

" In recent and small ruptures, this sac is very visible; but in old, and large ones, it is broken through at the knot of the navel, by the pressure and weight of the contents, and is not always to be distinguished; which is the reason why it has by some been doubted whether this kind of rupture has a hernial sac or not.

" Infants are very subject to this disease in a small degree, from the separation of the funiculus; but in general they either get rid of it as they gather strength, or are easily cured by wearing a proper bandage. It is of still more consequence to get this disorder cured in females, even than in males, that its return, when they are become adult, and pregnant, may be prevented as much as possible; for at this time it often happens, from the too great distention of the belly, or from unguarded motion when the parts are upon the stretch. During gestation, it is often very troublesome, but after delivery, if the contents have contracted no adhesion, they will often return, and may be kept in their place by a proper bandage.

" If such bandage was always put on in time, and worn constantly, the disease might in general be kept within moderate bounds, and some of the very terrible consequences which often attend it might be prevented. The woman who has the smallest degree of it, and who from her age and situation has reason to expect children after its appearance, should be particularly careful to keep it restrained.

" In some the entrance of the sac is large, and the parts easily reducible; in others they are difficult, and in some absolutely irreducible. Of the last kind many have been suspended for years in a proper bag, and have given little or no trouble. They who are afflicted with this disorder, who are advanced in life, and in whom it is large, are generally subject to colics, diarrhœas, and, if the intestinal canal be at all obstructed, to very troublesome vomitings. (Hence, patients are often supposed to labour under a stricture, when they really do not.) It therefore behoves such to take great care to keep that tube as clean and free as possible, and neither to eat, or drink any thing likely to make any disturbance in that part." (*Pott on Ruptures, Vol.* 2.)

Authors, who have published since the time of this celebrated surgeon, have not added much to the stock of information, which he has left, relative to the exomphalos. The writings of Mr. A. Cooper, Scarpa, (*Traité des Hernies, p.* 327.) and of all the most accurate moderns, confirm the fact described by Pott, that, in the umbilical rupture, there is a hernial sac, just as in other instances of herniæ. Every one, acquainted with anatomy, knows, that behind the opening in the linea alba at the umbilicus, the peritoneum is complete, and consequently must be protruded before the viscera, in cases of exomphalos. In the only two cases, which Mr. A. Cooper has seen of a deficiency of the sac, the membrane had been partially absorbed, or lacerated, so as to allow the protrusion of its contents, and threaten, from this cause, a double stricture. Similar appearances, less closely inspected, probably gave rise to the opinion so firmly maintained by Dionis, De la Faye, Garengeot, and J. L. Petit, that in the umbilical hernia, the peritoneum was always lacerated, and there was no hernial sac. It is observed by Bichat, that the umbilicus is a kind of cicatrix, formed, in consequence of the separation of the funis, by the contraction of the parts with which it was continuous; and that it only gradually acquires the degree of firmness which it has in the adult subject. As it is for a long while weaker than the rest of the abdominal parietes, it only makes an inferior degree of resistance to the viscera; but this resistance increases with age; and, as the cicatrix now becomes stronger than the surrounding parts, it forms a more impenetrable barrier against any escape of the bowels. From these anatomical facts, the following pathological inferences, confirmed by experience, are deducible:—1. That infancy is more subject, than any other age, to the *umbilical* hernia, strictly so called, in which the parts protrude through the navel. 2. That other periods of life are more subject than infancy to false umbilical herniæ, or to those which arise in the vicinity of the umbilicus. (*Œuvres Chirurgicales de Desault, par Bichat, Tom.* 2, *p.* 315.)

Besides a true hernial sac, the exomphalos is also covered with a more superficial expansion, consisting of condensed cellular substance. In operating, we should always cut, however, with great caution; for, often the integuments and hernial sac, in front of the tumour, are inseparably adherent; and sometimes, in consequence of the pressure of the viscera, in large cases, having caused an absorption of part of the sac, they are even found adherent to the integuments.

Pregnant women, and dropsical and corpulent subjects, are peculiarly liable to the exomphalos. In adults, there is almost always omentum in the sac when there is intestine. The transverse arch of the colon is observed to be particularly often contained in umbilical herniæ, but the small intestines are not unfrequently protruded; and even the cæcum has been found in a rupture at the navel. (*See Lawrence on Ruptures*, *p.* 427, *Edit.* 3.)

In the true umbilical hernia, the stricture is made by the tendinous opening in the linea alba. We shall next consider the umbilical hernia in the three particular forms in which it has been noticed by the latest writers.

### CONGENITAL UMBILICAL HERNIA.

Dr. Hamilton has met with about two cases of this kind annually, for the space of seventeen years; and they strictly deserve the epithet *congenital* as they appear at birth. The funis ends in a sort of bag, containing some of the viscera, which pass out of the abdomen through an aperture in the situation of the navel. The swelling is not covered with skin, so that the contents of the hernia can be seen through the thin distended covering of the cord. The disease is owing to a preternatural deficiency in the abdominal muscles, and the hope of cure must be regulated by the size of the malformation, and quantity of viscera protruded.

The plans of cure proposed, consist of the employment of a ligature, or of a bandage. The latter seems preferable, and was practised by Mr. Hey, as follows: having reduced the intestine, he desired an assistant to hold the funis compressed sufficiently near the abdomen, to keep the bowel from returning into the hernial sac.

"I procured (says he) some plaster spread upon leather, cut into circular pieces, and laid upon one another in a conical form. This compress I placed upon the navel, after I had brought the skin on each side of the aperture into contact, and had laid one of the lips a little over the other. I then put round the child's abdomen, a linen belt; and placed upon the navel, a thick, circular, quilted pad, formed about two inches from one extremity of the belt.

"This bandage kept the intestine securely within the abdomen, and was renewed occasionally. The funis was separated about a week after birth; and at the expiration of a fortnight from that time, the aperture at the navel was so far contracted, that the crying of the child, when the bandage was removed, did not cause the least protrusion. I thought it proper, however, to continue the use of the bandage a little while longer. A small substance, like fungous flesh, projected, after the funis had dropped off, about half an inch from the bottom of that depression which the navel forms. A dossil of lint spread with cerat. è lapide calaminari, and assisted by the pressure of the bandage, brought on a complete cicatrization." (*P.* 227.)

This gentleman has related another example, in which the intestines were quite uncovered, and inflamed, the sac having burst in delivery. The parts were reduced; but the child died.

### UMBILICAL HERNIA IN CHILDREN.

The umbilical hernia, which is sometimes formed in the fœtus, from causes difficult of explanation, takes place, in other instances, at the moment of delivery; and then, as Sabatier remarks, should it, by mistake, be tied with the funis, death would be the consequence. Most frequently, however, it is not till the second, third, or fourth month after birth, that the disease occurs; and the numerous cases collected by Desault, prove that, of ten infants attacked with this hernia, nine become afflicted at the periods just mentioned.

The umbilicus, still open, now begins to contract, so as to close the cicatrix, which, as has been already stated, forms, in the adult state, an obstacle soon capable of preventing a protrusion of the viscera, when nothing resists its formation. But, the repeated crying of the child, propelling the viscera outward, pushes them through the opening. Thus the cicatrix is forced before them, and they distend it so powerfully forward, that its closure is prevented. As their continued action gradually dilates it more and more, the intestines insinuate themselves through it, increase its natural width, project beyond it, and thus a tumour arises, which, from being of trivial size at first, becomes afterwards more considerable; at length, attains the size of an egg, or large walnut, and presents itself with all the characteristic marks of a hernia.

The presence of a piece of intestine and omentum in the tumour, keeps the umbilicus open, and opposes the continual tendency which it has to close. Such tendency, however, being sometimes superior to the resistance of the protruded parts, forces them to return back into the abdomen, obliterates the opening through which they passed, and thus the spontaneous cure of the umbilical hernia in children is accomplished. Two cases illustrative of this fact, are related in the *Œuvres Chirurgicales de Desault, par Bichat, Tom.* 2, *p.* 318.

Nature, however, does not effect many such cures, and when the case is left to her alone, she not only fails in bringing about a radical cure, but gradually renders it impossible. In short, the propensity of the opening to close diminishes, and is lost, as the subject grows older. In the adult, it is not the lodgment of the intestines in the opening, that prevents its obliteration; it is its having no disposition to undergo this beneficial change.

Hence, the umbilical hernia of children seems to be essentially distinguished from that of adults, by the tendency of the aperture to contract. Hence the ease of effecting a radical cure in children, and the almost utter impossibility of doing so in adults. In the former, it is enough to keep the intestines from protruding into the opening, and it becomes of itself obliterated; in the latter, it always continues, whether the bowels continue in it or not. Hence, the inaccuracy of the inferences deduced by some writers, from the umbilical hernia of infants, as being applicable to that of adults, and the necessity of not delaying the assistance of art in the former cases.

The means of curing the umbilical hernia of children, are of three kinds: external applications; compression; and the ligature. The first are totally useless; and, as they occasion a waste of time, are improper. Compression, and the ligature, are the only rational plans; and to these we shall limit our observations. The former is the most modern, the latter the most ancient, as it was practised by the Greeks, and then by Celsus. Desault has drawn a most able parallel between the two modes; he tells us, that the design both of the ligature and compression is the same, viz. to prevent the lodgment of the protruded viscera in the opening of the umbilicus, and thus facilitate the approximation of its sides. To accomplish this end, the ligature retrenches the hernial sac, and skin pushed before it; and, by the union of the cut parts, occasions a cicatrix, which hinders the protrusion of the viscera. At the same time, the sides of the opening, obeying their natural tendency, and affected by the irritation which they have sustained, contract, obliterate the opening, and put the cicatrix in its proper place, though now it is only an accessory means of hindering a protrusion. Compression stops up the aperture by something applied externally; thus, it closes the deficiency, or opening, in the parietes of the abdomen, hinders the protrusion of the bowels, and keeps these parts from resisting the contraction of the sac. Hence it is clear, that the two methods are founded on a different basis. Reason and experience also shew, that their results are equally different.

Though compression occasions no pain, it causes the child an irksome inconvenience, during the great length of time its employment is necessary. The ligature produces momentary pain; but there is nothing irksome attending its use, and it effects in a few days, what compression, when successful, accomplishes in several months. In one plan, long continual attention is requisite: should its employment be only for a short time neglected, the previous effect becomes almost destroyed. The other method always accomplishes its object with certainty, independently of the crying of the child, and the care of its attendants. The first, by continually compressing the sides of the opening, counteracts, in this point of view, its natural disposition to contract. The second, by artificially irritating this natural process of the umbilicus, accelerates its contraction. When compression is adopted, it is executed either by means of a flat compress applied to the opening, and which does not enter it, or else by means of some round or oval body, such as a ball of wax, a nutmeg, &c. adapted to the shape of the aperture, and, as Platner, and Richter, (in his Treatise on Hernia) advise, made continually to enter the opening. But, in the first case, if the bandage be exactly applied, the skin and sac, forming a fold in the aperture of the navel, will hinder its closure, and operate in the same manner, from without, inward, as the protruded intestines did from within outward. In the second case, the foreign body, being depressed into and maintained in the opening, will occasion, notwithstanding what Richter says, the same inconveniences, and, in a more striking manner, similar consequences. But, on the contrary, when the ligature is employed, the sac and skin of the tumour are removed, while the opening remains free, and nothing prevents its obliteration. In this method, the omentum can never protrude outward; but, in the other, if the compression should ever be inexact, the parts slip out again, above or below, and the disorder prevails on one side of the useless application. Supposing compression successful, both plans effect a closure of the umbilicus; but, while compression only accomplishes the latter object, the ligature has the additional advantage of producing an adhesion of the sides of the opening, either to each other, or the adjacent parts. This adhesive process arises from the inflammation excited, and occasions a degree of firmness, not producible by any other mode of cure.

To this parallel, dictated by reason, (continues Desault) let us add that, which is the fruit of experience. On one side, we shall discover, that the beneficial effects of compression are only reckoned in the midst of its want of success, and that the children, on whom it is employed, miserably endure for years its irksomeness and inconveniences. If we look the other way, we shall find, that the ligature, which is employed at the Hôtel-Dieu, presents an uninterrupted series of well authenticated cures, which, in Desault's practice, amounted to the number of fifty. In the latter years of his practice, you might see many persons bringing to his public consultations their children, which were immediately operated on without any preparation, carried home immediately afterwards, and brought the next, and every following day, to be dressed, till the cure was complete.

To these considerations, are to be added other motives, which are, perhaps, not immaterial. The children of the poor may be cured in an hospital, by the ligature, in the space of a few days. But, when compression is adopted, the parents are frequently put to repeated expense, as the bandage wears out; and to additional loss from the time consumed in paying the necessary attention.

The ancients had different modes of applying the ligature; but, what they have transmitted to us, may be referred to two different processes. One consisted in reducing the parts, and afterwards tying the integuments and sac, without opening the latter at all. In the other, an incision was made in the sac, either before, or after tying it, for the purpose of being sure, that no piece of intestine was, and could become, strangulated in the ligature. Celsus adopted the first plan. Paulus Ægineta preferred the second, and was imitated by all the Arabian physicians, and their successors. Avicenna, Albucasis, and Guy de Chauliac give us proofs of this in their several works.

Experience soon decides, which of these modes of operating ought to be chosen. One is less painful, and equally safe; for, we soon become habituated to ascertaining, whether there is still any intestine in the sac, by rubbing the opposite sides of this bag against each other. The other, which is unnecessarily cruel, increases the pain, without making the method at all more certainly successful. The latter has been usually adopted, and Paré, who has described it, does not even mention the former. Latterly, some variations in the plan of operating were made. Some simply tied the base of the tumour; others passed through it one, or two needles, armed with ligatures for the purpose of fixing such ligatures in a better manner, and even making, for this purpose, a circular incision for the lodgment of them. It is chiefly in the Arabian practice, that we meet with this cruel proceeding, which was also useless, as the ligature was never known to fail, when properly applied. Paré also describes it; but, Saviard, the only modern, who has practised the ligature, rejected it, and followed the plan long ago advised by Celsus. Sabatier seems to recommend, in his work on the operations, both plans indifferently, with the exception of the circular incision. Desault's method, which much resembles that of Saviard, is simple, and attended with little pain: in short, it is the following:

The child, on whom the operation is to be done, must be placed on its back, with its thighs a little bent, and its head inclined towards the chest. The surgeon is to reduce the protruded parts, forming the tumour, and to hold them so with his finger, at the same time, that he raises the hernial sac, and rubs its sides between his fingers, so as to be sure, that there is nothing contained in it. Being certain, that the parts, which he lifts up, are only the skin and sac, he is to direct an assistant to surround their base several times with a waxed ligature, of middling size, each turn being tied with a double knot, in such a manner as only to occasion little pain. The tumour, thus tied, is to be covered with lint, which is to be supported with one or two compresses, and a circular bandage, secured with a scapulary. A slight swelling commonly takes place in the constricted parts, by the following day, just as a polypus swells, after its base has been tied.

No pain accompanies this tumefaction, which is itself often scarcely perceptible, as may be seen by referring to the first case of this operation related in the Parisian Journal. On the second, or third day, the parts shrink, and then the ligature becomes loose, so that a fresh one must now be applied in the same manner as the first, taking care to draw it a little more tightly. The sensibility of the parts, increased by the inflammation, which the constriction of the ligature has already produced, usually renders this second ligature more painful. After the operation, the same dressings, as before, are to be applied. The tumour soon becomes discoloured, livid, and smaller. A third ligature, put on in the same way as the preceding ones, entirely obstructs the circulation in it. The part turns black and flaccid, and commonly falls off on the eighth or tenth day. A small ulcer is left, which, being properly dressed, very soon heals, and leaves a cicatrix sufficiently strong to resist the impulse occasioned by coughing, or other efforts of the abdominal muscles. For two, or three months, however, after the operation, the child should wear a circular bandage, in order to prevent, with still more certainty, the viscera from being propelled against the cicatrix, so as to interrupt the process of nature, which is now producing a gradual closure of the umbilical opening. Numerous cases might here be adduced, in confirmation of the above practice; but, several (nine) are already published in the Parisian Chirurgical Journal. The relation of others here would only prolong our observations in a fruitless manner. Suffice it to remark, that since those alluded to were published, Desault has practised an infinite number of operations of this sort with equal success; that, every week, many children were brought by their mothers into the amphitheatre where he publicly delivered his lectures; that here the ligature was applied in the presence of all his pupils; and that children, thus operated upon, were carried home, and brought back, every day to be dressed, till the cure was completed.

But, one may doubt, (says Sabatier) quoting the article in the journal, where Desault treats of the present disease, whether the infants got rid of the hernia, as it might have returned some time afterwards. Numerous facts remove this doubt; for, several of the subjects were brought to Desault's public consultation, for other diseases, a long while after they had been operated upon, and the great number of students, who examined them, all acknowledged, that the ring was completely obliterated, and there was no impulse of the viscera in coughing, sneezing, &c. Other children, in the knowledge of the surgeons of the Hôtel-Dieu, have remained perfectly cured of their umbilical herniæ, by the operation, which Desault has revived. Bichat is acquainted with two young subjects, who were operated on four years ago, and have since had no relapse.

The operation is almost certainly successful in young infants; but, it becomes less so, in proportion as their age increases. Bichat relates three cases, which tend to show, that success may be completely obtained at the age of a year and a half; that the cure is difficult, when the child is four years old; and impossible, when it is nine. Several other operations, done too late, have had the same result. (See *Œuvres Chirurgicales de Desault, par Bichat, Tom. 2, p.* 315, *&c.*)

Mr. Pott notices the plan of curing the exomphalos with the ligature, and expresses himself strongly against the practice in general. To adults the plan is not applicable, particularly, when the tumour is large. Mr. Pott was decidedly in favour of compression, and he observes, that, in young subjects, and small herniæ, a bandage, worn a proper time, generally proves a perfect cure. (*Vol.* 2.)

Anxious that this work should be strictly impartial, I next proceed to relate what has been recently urged against the employment of the ligature for the cure of the umbilical hernia in children, and to notice the observations which have been adduced in favour of the treatment by compression.

The incessant care that a bandage requires, either to keep it clean, or make it always keep up the proper degree of pressure, renders its employment difficult in the children of the poorer classes. Scarpa expresses his opinion, that "this was what induced Desault to revive the operation for the umbilical hernia by the ligature, nearly such as is described by Celsus, an operation (continues Scarpa), which, a long while since, and for good reasons, was altogether abandoned. Celsus has sufficiently described the particulars of it: (*Lib.* 7, *Cap.* 14.) he states, that the tumour is sometimes to be simply tied, and that, in other instances, its base is to have a needle and double ligature introduced through it, in order that it may be embraced almost in the same way as a staphyloma is tied. But, amongst the causes, which contra-indicate this operation, he mentions so many circumstances, in relation to age, constitution, diseases of the skin, &c. that he seems to consider the cases, in which it may be practised with success, as very few. The same reflections have been made by several other ancient surgical writers, especially, by Fabricius ab Aquapendente. Desault himself has put some restrictions to the employment of the ligature, since he observes, with his usual candour, that this method does not radically cure the umbilical hernia of children, arrived at the age of four years; that it is indispensable, as Celsus inculcates, to employ a needle and double ligature, when the base of the tumour is very large; and, lastly, that, even in the youngest children, a radical cure cannot be effected by the ligature, unless a methodical compression of the navel, by means of a bandage, be kept up immediately after the operation, and for two or three months. It is perhaps to the omission of this last means, that a relapse is to be ascribed in several of the children operated upon by Desault. "*Desault avoit remis en vigueur la ligature tombée en désuétude. Il s'abusoit sur sa valeur; et il n'est pas difficile d'en connôitre la cause. Tous les enfans qu'il opéroit à l'Hôtel-Dieu sortoient guéris et n'y revenoient plus: on regardoit alors comme radicale une guérison momentanée.*" (*Nosographie Chirurgicale, Tom. 2, p.* 453, *par Richerand.*) I have carefully watched (says Scarpa) the immediate effects, and the more or less remote consequences of tying the umbilical hernia, either simply, or by means of a needle and double ligature; and, after a considerable number of such cases, I believe I can assert, that *this operation, howsoever performed, is not always exempt from grave and sometimes dangerous accidents. I can also add, that it never procures a truly radical cure, unless the cicatrix, occasioned by it in the umbilical region, be submitted for some months to a methodical and uninterrupted compression. It is not so uncommon, as some surgeons pretend, to see arise after the application of the ligature, a fever attended with symptoms of most violent irritation, and acute sufferings, which cause incessant crying, and sometimes convulsions. The ulcer, which is produced by the detachment of the swelling, is always very large and difficult to heal. Every now and then it becomes painful, and emits fungous granulations, even though dressed with dry applications.*

"Latterly, it has been explained by a celebrated surgeon, (*Paletta Memor. dell' Instituto, Tom.* 2, *Part* 1.) that the umbilical vein, and the suspensory ligament of the liver, being included in the ligature of the umbilical hernia, the inflammation, which originates in these parts may, perhaps, in certain cases, be communicated to the liver, so as to put the child's life in great danger. When, in consequence of the ligature, symptoms of violent irritation come on, they are ordinarily attributed to certain individual circumstances, such as extreme sensibility, or a particular disposition to spasm. Hence, it is believed, that they should be considered as exceptions, which do not exclude the general rule, and prove nothing against the utility of the operation. But, how (says Scarpa) can the surgeon ascertain the existence, or non-existence of these individual dispositions, in the children, upon which he is to operate? Assuredly, those subjects, in which I have had occasion to notice the above accidents, enjoyed, before the operation, perfect health in every respect.

"Whatever process be adopted for tying the umbilical hernia, it is evident, that the tumour can only be constricted as far as a little way on this side of the aponeurotic ring of the umbilicus, whence, it follows, that the integuments must always remain prominent and relaxed for a certain extent, at the front and circumference of this opening. Also, after the separation of the strangulated portion, there necessarily remains, under the cicatrix, a portion of the hernial sac, and of the loose integuments, which covered it; and as the cicatrix itself never acquires sufficient firmness to resist the impulse of the viscera, which tend to insinuate themselves into the remains of the hernial sac, the hernia sooner or later reappears, and, in a short time, becomes larger, than it was before the operation. If the subject is a little girl, it may be apprehended, that the first pregnancy will cause a recurrence of the hernia; for, it is known, that, during gestation, the external cicatrix of the umbilicus, is considerably distended, and much disposed to give way."

Pott has seen terrible accidents caused by the rupture of the cicatrix at the navel, during pregnancy. (*Chirurg. Works, Vol.* 2, *p.* 169.) It is true that according to this writer, this cicatrix was not the consequence of a hernia, but rather of an abscess in the umbilical region, which abscess had formerly been opened with a bistoury; yet, observes Scarpa, it would not be impossible to raise doubts upon this conjecture. Lastly, after the separation of the tumour, there always remains, between the aponeurotic ring of the navel, and the integuments, a small cavity, formed by the neck of the hernial sac; a cavity, into which the viscera begin to insinuate themselves after the operation, so as to hinder the complete contraction of the umbilical ring. The demonstration of what I have advanced is, in some measure to be found, in the old method of operating for the inguinal hernia, not in a strangulated state, by the ligature of the hernial sac and spermatic cord. It is well known, that most of the herniæ, operated upon by this barbarous process, were subject to relapses, because, in all probability, the cicatrix was not sufficiently firm to resist the impulse of the viscera, which entered the remains of the hernial sac. In the same manner, after the common operation for the strangulated inguinal hernia, although the cicatrix is formed very near the ring, there is no prudent surgeon, who does not advise the patient to wear a bandage the rest of his life, observation having proved, that the hernia is still liable to recur.

"An experience of several ages (observes Professor Scarpa) has put out of all doubt, that compression alone is an extremely efficacious method of radically curing the umbilical hernia of young subjects. It is attended with no risk, and, provided it be executed with the requisite caution, it is hardly ever necessary to continue it longer, than two, or three months, for the purpose of obtaining a complete cure. On the other side, if it be clearly proved, by all that I have been observing, that the ligature never accomplishes a perfect cure without compression, it is manifest, that it cannot be at all advantageous for the children of the poor, since a bandage cannot be dispensed with. It may be said, that, in general, it does not shorten the treatment; for, in the most successful cases, the ulcer, caused by it, is not healed in less than a month, and, in order to make the cure certain, an exact compression must afterwards be kept up, by means of a bandage, two months longer. It has already been stated, that three months are ordinarily sufficient for obtaining a radical cure by the mere employment of a compressive bandage." (*Scarpa, Traité des Hernies, p.* 344—349.)

It appears from a note, which M. Cayol has inserted in the French translation of Scarpa's work on hernia, that M. Girard has published in the Journal Général de Médecine, Tom. 41, Cahier de Juillet, 1811, a memoir on the umbilical hernia of children, which was read to the Medical Society of Lyons in May, 1811, and the object of which was to recommend compression as an effectual means of cure. The arguments used were very similar to those adduced by Scarpa. In the course of the discussion, M. Cartier affirmed, that he had seen many children operated upon by Desault, who were not cured of their hernia.

The subject was afterwards taken up by the Medical Society of Paris, and the result of the debate was, that the employment of the ligature ought to be rejected. 1. Because the cure of umbilical herniæ is very often accomplished by the power of nature alone. 2. Because compression, either alone, or aided by tonic remedies, always succeeds. 3. Because the operation of the ligature deserves the triple reproach of being painful, and not free from danger, if unfortunately a piece of intestine should chance to be included in the ligature; of not succeeding in general, unless with the assistance of compression; and of being sometimes uselessly practised, as Desault himself gives us instances of.

It is further stated by M. Cayol, that the majority of judicious surgeons have long since acknowledged the insufficiency of the ligature for the radical cure of the umbilical hernia; Sabatier, Lassus, Richerand, &c.

### UMBILICAL HERNIA IN ADULT SUBJECTS.

This case is to be treated on the principles common to all ruptures. When reducible, the parts should be kept up with a bandage, or truss; which plan, however, in this period of life, affords no hope of a radical cure. Mr. Hey has described one of the best trusses for the exomphalos, which is applicable to children, when compression is preferred, as well as to adult subjects. It was invented by Mr. Marrison, an ingenious mechanic at Leeds.

"It consists of two pieces of thin elastic steel, which surround the sides of the abdomen, and nearly meet behind. At their anterior extremity they form conjointly an oval ring, to one side of which is fastened a spring of steel of the form represented. At the end of this spring is placed the pad or bolster that presses upon the hernia. By the elasticity of this spring the hernia is repressed in every position of the body, and is thereby retained constantly within the abdomen. A piece of calico or jean is fastened to each side of the oval ring, having a continued loop at its edge, through which a piece of tape is put, that may be tied behind the body. This contrivance helps to preserve the instrument steady in its proper situation." (*Practical Obs. in Surgery, p.* 231.)

When the exomphalos is irreducible, and large, the tumour must be supported with bandages.

It is observed by Professor Scarpa, that the umbilical hernia, and those of the linea alba, are less subject to be strangulated, than the inguinal and femoral herniæ; but that, when they are unfortunately affected with strangulation, the symptoms are more intense, and gangrene comes on more rapidly, than in every other species of rupture. If the operation be performed, the event is frequently unfavourable, because it is generally done too late. This practical fact is proved by the experience of the most celebrated surgeons of every age. "*Il est certain* (says Dionis) *que de cette opération il en périt plus qu'il n'en réchappe.*" (*Cours d'Opérations, p.* 98, *Edit.* 1777, *avec les notes de La Faye.*) He also adds, that they, who have the misfortune to be afflicted with an exomphalos, should rather dispense with their shirt, than a bandage. Heister says nearly the same thing (*Instit. Chirurg. Tom.* 2, *Cap.* 94.)

It is further remarked by Scarpa, that when the omentum alone is strangulated in the exomphalos, or herniæ of the linea alba, observation proves, that the symptoms are not less intense, than when the intestine is also incarcerated. There is this difference, however, that when the omentum alone is strangulated, only nausea occurs, and, if vomiting should likewise take place, it is less frequent and violent than when the bowel itself is strangulated. In the first case, the stools are hardly ever entirely suppressed. The proximity of the stomach is, no doubt, the reason, why the strangulation of the omentum, in the umbilical hernia, occasions far more intense symptoms of sympathetic irritation, than the strangulation of the same viscus in the inguinal, or crural hernia.

Here, says Scarpa, the operation is not only always necessary, but urgently required. It is not materially different from that, which is practised for the strangulated inguinal and crural herniæ; but, in general, it demands greater circumspection, on account of the connexion, or intimate adhesions, which frequently exist, between the integuments and hernial sac, and also the adhesions, which often prevail between the latter part and the omentum which it contains. The situation of the intestine, which is frequently covered by, and enveloped in the omentum, is another circumstance deserving earnest attention. (*Scarpa, Traité des Hernies, p.* 361, 362.)

Mr. Pott is not such an advocate as Scarpa for the early performance of the operation in cases of exomphalos: "The umbilical, like the inguinal hernia, becomes the subject of chirurgic operation, when the parts are irreducible by the hand only, and are so bound as to produce bad symptoms. But though I have in the inguinal and scrotal hernia advised the early use of the knife, I cannot press it so much in this: the success of it is very rare, and I should make it the last remedy. Indeed I am much inclined to believe, that the bad symptoms which attend these cases are most frequently owing to disorders in the intestinal canal, and not so often to a stricture made on it at the navel, as is supposed. I do not say that the latter does not sometimes happen; it certainly does; but it is often believed to be the case when it is not.

"When the operation becomes necessary, it consists in dividing the skin and hernial sac, in such manner as shall set the intestine free from stricture, and enable the surgeon to return it into the abdomen." (*Pott on Ruptures.*)

The rest of the conduct of the surgeon is to be regulated by the usual principles.

The division of the stricture is properly recommended to be made directly upward, in the course of the linea alba.

In consequence of the great fatality of the usual operation for the exomphalos, I think the plan suggested, and successfully practised by Mr. A. Cooper in two instances, should always be adopted, whenever the tumour is at all large, and free from gangrene; a plan, that has also received the high sanction of that distinguished anatomist and surgeon, Professor Scarpa. (*Traité des Hernies, p.* 362.) I might, perhaps, safely add, that when the parts admit of being reduced, without laying open the sac, this method should always be preferred. It consists in only making an incision sufficient to divide the stricture, without opening the sac at all, or, at all events, no more of it, than is inevitable.

In umbilical herniæ, of not a large size, Mr. C. recommends the following plan of operating: "As the opening into the abdomen is placed towards the upper part of the tumour, I began the incision a little below it, that is, at the middle of the swelling, and extended it to its lowest part. I then made a second incision at the upper part of the first, and at right angles with it, so that the double incision was in the form of the letter T, the top of which crossed the middle of the tumour. The integuments being thus divided, the angles of the incision were turned down, which exposed a considerable portion of the hernial sac. This being then carefully opened, the finger was passed below the intestines to the orifice of the sac at the umbilicus, and the probe-pointed bistoury being introduced upon it, I directed it into the opening at the navel, and divided the linea alba downwards, to the requisite degree, instead of upwards, as in the former operation. When the omentum and intestine are returned, the portion of integument and sac, which is left, falls over the opening at the umbilicus, covers it, and unites to its edge, and thus lessens the risk of peritoneal inflammation, by more readily closing the wound." (*On Crural and Umbilical Hernia.*)

### LESS FREQUENT KINDS OF HERNIA.

The *ventral hernia*, described by Celsus is not common; it may appear at almost any point of the anterior part of the belly, but, is most frequently found between the recti muscles. The portion of intestine, &c. is always contained in a sac, made by the protrusion of the peritonæum. Mr. A. Cooper imputes the disease to the dilatation of the natural foramina for the transmission of vessels, to congenital deficiencies, lacerations, and wounds, of the abdominal muscles, or their tendons. In small ventral herniæ, a second fascia is found beneath the superficial one; but, in large cases, the latter is the only one covering the sac.

Herniæ in the course of the linea alba sometimes occur so near the umbilicus, that they are liable to be mistaken for true umbilical ruptures. They may take place either above, or below the navel. The first case, however, is more frequent, than the second, and the following is the reason of this circumstance according to the opinion of Scarpa. "The upper half of the linea alba, that which extends from the ensiform cartilage to the umbilicus, is naturally broader and weaker, than the lower half, the recti muscles becoming nearer and nearer together, as they descend from the navel to the pubes." (*Scarpa, Traité des Hernies, p.* 333.)

The hernial sac of ruptures at the upper part of the linea alba may contain a noose of intestine, and a piece of the omentum, though, in most cases, a portion of the latter membrane alone forms the contents. In some subjects, the linea alba is so disposed to give way, that several herniæ are observed to be formed successively in the interspace between the ensiform cartilage and the umbilicus.

"With respect to the small hernia (says Scarpa) which is considered as formed by the stomach, and concerning which Hoin and Garengeot have written so much (without either of them having related, at least to my knowledge, a single example proved by dissection), it is at least unproved, that it was exclusively formed by this viscus. I do not see, why the other viscera, particularly the omentum and transverse colon, might not also contribute to it. In my judgment, it only differs from other herniæ of the linea alba, in being situated on the left side of the ensiform cartilage, a situation, that must materially influence the symptoms of the case. In fact, whatever may be the viscera, which form it, a sympathetic irritation of the stomach is occasioned, that is much more intense, than that which ordinarily accompanies umbilical herniæ, those of the lower part of the linea alba, or, in short, all other herniæ, which are more remote from the stomach." (*Op. cit. p.* 334.)

The following are said to be the circumstances, by which the umbilical hernia, and that which occurs in the linea alba near the navel, may be discriminated.

The first, whether in the infant, or the adult, has a roundish neck, or pedicle, at the circumference of which the aponeurotic edge of the umbilical ring can be felt. Whatever may be its size, its body always retains nearly a spherical shape. Neither at its apex, or its sides, is any wrinkling of the skin, or any thing like the cicatrix of the navel, distinguishable. In some points of the surface of the tumour, the skin is merely somewhat paler and thinner, than elsewhere.

On the contrary, the hernia of the linea alba has a neck, or pedicle, of an oval form, like the fissure, through which it is protruded. The body of the tumour is also constantly oval. If the finger be pressed deeply round its neck, the edges of the opening in the linea alba can be felt; and, if the hernia be situated very near the umbilical ring, the cicatrix of the navel may be observed upon one side of it, which cicatrix retains its rugosity and all its natural appearance; a certain indication, that the viscera are not protruded through the umbilical ring. (*Scarpa, Traité des Hernies, p.* 336.)

The distinction, which Scarpa has established between the umbilical hernia, properly so called, and those of the linea alba, is not useless in regard to practice. Indeed when the latter are left to themselves, they make much slower progress than the former. On account of their smallness, they frequently escape notice, particularly in fat persons, and, when situated at the side of the ensiform cartilage. They occasion, however, complaints of the stomach, habitual colics, especially after meals; and, unfortunately for the patient, he may be tormented a very long time by these indispositions, before the true cause of them is discovered.

The umbilical hernia may be known, from the earliest period of its formation, by the alteration which it produces in the cicatrix of the navel, and the rapidity of its increase.

In other respects, these two kinds of herniæ demand the same means of cure; but, those of the linea alba, *cæteris paribus*, are more difficult to cure, than ruptures at the umbilicus. This is probably owing to the natural tendency, which the umbilical ring has to close, when the hernia is kept well reduced, whilst accidental openings in the linea alba, have not the same advantage. (*Scarpa, p.* 340.)

When a common ventral hernia is reduced, it should be kept in its place by means of a bandage or truss. When strangulated, it admits, more frequently than most other cases, of being relieved by medical treatment. If attended with stricture, which cannot otherwise be relieved, that stricture must be carefully divided. Mr. A. Cooper recommends the valvular incision, and the dilatation to be made, either upward, or downward, according to the relative situation of the tumour and epigastric artery, which crosses the lower part of the linea semilunaris.

*Pudendal Hernia.*—This is the name assigned by Mr. A. Cooper, to that which descends between the vagina and ramus ischii, and forms an oblong tumour in the labium, traceable within the pelvis, as far as the os uteri. Mr. C. thinks this case has sometimes been mistaken for a hernia of the foramen ovale. When reducible, a common female bandage, or the truss used for a prolapsus ani, should be worn. A pessary, unless very large, could not very well keep the parts from descending, as the protrusion happens so far from the vagina. Mr. C. is of opinion, that, when strangulated, this hernia, in consequence of the yielding nature of the parts, may generally be reduced, by pressing them with gentle and regular force, against the inner side of the branch of the ischium. If not, the warm bath, bleeding, and tobacco glysters, are advised. Were an operation indispensable, the incision should be made in the labium, the lower part of the sac carefully opened, and, with a concealed bistoury, directed by the finger, in the vagina, the stricture should be cut directly inward, towards the vagina. The bladder should be emptied, both before the manual attempts at reduction and the operation. (*On Crural Hernia, &c. p.* 64.)

*Vaginal Hernia.*—A tumour occurs within the os externum. It is elastic, but not painful. When compressed, it readily recedes, but, is reproduced by coughing, or even without this when the pressure is removed. The inconveniences produced are an inability to undergo much exercise, or exertion; for, every effort of this sort brings on a sense of bearing down. The vaginal hernia protrudes in the space, left between the uterus and rectum. This space is bounded below by the peritonæum, which membrane is forced downwards towards the perinæum; but, being unable to protrude further in that direction, is pushed towards the back part of the vagina. Mr. C. advised the use of a pessary in one case; the plan, however, was neglected. These cases, probably, are always intestinal.

Some herniæ protrude at the anterior part of the vagina. (See *Mr. A. Cooper on Crural Hernia, &c. p.* 65, 66.)

*Perineal Hernia.*—In men, the parts protrude between the bladder and rectum; in women, between the rectum and vagina. The hernia does not project, so as to form an external tumour, and, in men, its existence can only be distinguished by examining in the rectum. In women, it may be detected both from this part, and the vagina.

In case of strangulation, the hernia might, perhaps, be reduced by pressure from within the rectum. An interesting case of perineal hernia, which took place from the peritonæum being wounded with the gorget in lithotomy, is related by Mr. Bromfield; *Chirurgical Obs. p.* 264.

The reducible perineal hernia in women, may be kept from descending, by using a large pessary. Both this kind of rupture and the vaginal may prove very dangerous in cases of pregnancy. (See *Smellie's Midwifery, Case* 5.)

*Thyroideal Hernia*, or *Hernia Foraminis Ovale.* In the anterior and upper part of the obturator ligament, there is an opening, through which the obturator artery, vein, and nerve proceed, and through which, occasionally, a piece of omentum, or intestine is protruded, covered with a part of the peritonæum, which constitutes the hernial sac.

In the case, which Mr. A. Cooper met with, the hernia descended above the obturatores muscles. The os pubis was before the neck of the sac; three-fourths of it were surrounded by the obturator ligament; and the fundus of the sac lay beneath the pectineus and adductor brevis muscles. The obturator nerve and artery were situated behind the neck of the sac, a little towards its inner side. This species of hernia can only form an outward tumour, when very large. Garengeot, however, met with an instance, in which there was not only a swelling, but, one attended with symptoms of strangulation: he reduced the hernia, which went up with a guggling noise; the symptoms were stopped, and stools soon followed.

The hernia of the foramen ovale, when reducible, must be kept up with a suitable truss; and when strangulated, and not capable of relief from the usual means, an operation would be requisite, though attended with difficulties. The division of the obturator ligament and mouth of the sac should be made inwards, to avoid the obturator artery. This vessel, however, would even be exposed to injury by following this plan, if it should arise in common with the epigastric artery. (See *a paper by Garengeot in Mém. de l'Acad. de Chir. tom.* 1; *and A. Cooper on Crural Hernia, &c. p.* 70.)

*Cystocele.*—As Mr. Pott observes, "The urinary bladder is also liable to be thrust forth from its proper situation, either through the opening in the oblique muscle, like the inguinal hernia, or under Poupart's ligament, in the same manner as the femoral.

"This is not a very frequent species of hernia, but does happen, and has as plain and determined a character as any other.

"It has been mentioned by Bartholin, T. Dom. Sala, Platerus, Bonetus, Ruysch, Petit, Mery, Verdier, &c. In one of the histories given by the latter, the urachus, and impervious umbilical artery on the left side, were drawn through the tendon into the scrotum, with the bladder; in another he found four calculi.

"Ruysch gives an account of one complicated with a mortified bubonocele. Mr. Petit says he felt several calculi in one, which were afterwards discharged through the urethra.

"Bartholin speaks of T. Dom. Sala as the first discoverer of the disease, and quotes a case from him, in which the patient had all the symptoms of a stone in his bladder; the stone could never be felt by the *sound*, but was found in the bladder (which had passed into the groin) after death.

"As the bladder is only covered in part by the peritoneum, and must insinuate itself between that membrane and the oblique muscle, in order to pass the opening in the tendon, it is plain that the hernia cystica can have no sac, and that, when complicated with a bubonocele, that portion of the bladder which forms the cystic hernia must lie between the intestinal hernia and the spermatic chord, that is, the intestinal hernia must be anterior to the cystic.

"A cystic hernia may, indeed, be the cause of an intestinal one; for when so much of the bladder has passed the ring, as to drag in the upper and hinder part of it, the peritoneum which covers that part must follow, and by that means a sac be formed for the reception of a portion of gut or caul. Hence the different situation of the two herniæ in the same subject.

"While recent, this kind of hernia is easily reducible, and may, like the others, be kept within by a proper bandage; but when it is of any date, or has arrived to any considerable size, the urine cannot be discharged, without lifting up, and compressing the scrotum; the outer surface of the bladder is now become adherent to the cellular membrane, and the patient must be contented with a suspensory bag.

"In case of complication with a bubonocele, if the operation becomes necessary, great care must be taken not to open the bladder instead of the sac, to which it will always be found to be posterior. And it may also sometimes by the inattentive be mistaken for a hydrocele, and by being treated as such, may be the occasion of great or even fatal mischief." (*Vol.* 2.)

The cystocele is always easily distinguishable by the regular diminution of the swelling, whenever the patient makes water.

Verdier and Sharp have accurately described the cystocele. Pott has offered two cases, which fell under his observation; *Vol.* 3. Pipelet le Jeune mentions a cystic hernia in perinæo, and several cases of its occurrence in the female; *Acad. de Chir. tom.* 4. Pott cut into one cystocele, by mistake. Mention is made (*Edinb. Surg. Journ. vol.* 4, *p.* 512.) of a cystic hernia, which protruded between the origins of the levator ani, and obturator internus muscles: the tumour made its appearance in the pudendum of an old woman. Gunz and Hoin have also treated of the cystocele.

*Ischiatic Hernia.*—The case is probably very rare. A case, however, which was strangulated, and undiscovered till after death, is related in Mr. A. Cooper's second part of his work on hernia. It is communicated by Dr. Jones, already celebrated for his book on hemorrhage. The disease happened in a young man, aged 27. On opening the abdomen, the ilium was found to have descended on the right side of the rectum into the pelvis, and a fold of it was protruded into a small sac, which passed out of the pelvis at the ischiatic notch. The intestine was adherent to the sac at two points: the strangulated part, and about three inches on each side, were very black. The intestines towards the stomach were very much distended with air, and, here and there, had a livid spot on them. A dark spot was even found on the stomach itself just above the pylorus. The colon was exceedingly contracted, as far as its sigmoid flexure. A small orifice was found in the side of the pelvis, in front of, but a little above, the sciatic nerve, and on the forepart of the pyriformis muscle. The sac lay under the glutæus maximus muscle, and its orifice was before the internal iliac artery, below the obturator artery, but above the vein. Mr. A. Cooper remarks, that a reducible case might be kept up with a spring truss, and, that if an operation were requisite, the orifice of the sac should be dilated directly forwards. (*On Crural Hernia, &c. p.* 73.)

*Phrenic Hernia.*—The abdominal viscera are occasionally protruded through the diaphragm, either through some of the natural apertures in this muscle, or deficiencies, or wounds, and lacerations in it. The second kind of case is the most frequent: Morgagni furnishes an instance of the first. Two cases, related by Dr. Macauley in *Med. Obs. and Inq. Vol.* 1, two more detailed in the *Medical Records and Researches;* and two others published by Mr. A. Cooper; are instances of the second sort: and another case has been lately recorded by the latter gentleman, affording an example of the third kind. A laceration of the diaphragm by fractured ribs, has produced a hernia. A case of this kind was dissected by Mr. Travers, at Guy's Hospital. (*Medico-Chirurgical Trans. vol.* 6, *p.* 375.) In this last volume may also be found the particulars of an interesting example, in which a considerable part of the large curvature of the stomach was protruded through a fissure of the diaphragm. The accident was unattended with any fracture of the ribs, and was caused by the upsetting of a stage-coach, on which the patient was an outside passenger. Before death, he vomited up a large quantity of blood, and a small semicircular aperture was discovered on dissection in the lower part of the strangulated portion of the stomach. (*P.* 378—379.) Hildanus, Paré, Petit, Schenck, &c. also mention cases of phrenic hernia. The disease is quite out of the reach of art.

*Mesenteric Hernia.*—If one of the layers of the mesentery be torn by a blow, while the other remains in its natural state, the intestines may insinuate themselves into the aperture, and form a kind of hernia. The same consequence may result from a natural deficiency in one of these layers. Mr. A. Cooper records a case, in which all the small intestines, except the duodenum, were thus circumstanced. The symptoms during life were unknown. (*On Crural Hernia, &c. p.* 82.)

*Mesocolic Hernia.*—So named by Mr. A. Cooper, when the bowels glide between the layers of the mesocolon. There is a specimen of this disease, preserved at St. Thomas's hospital.

Every surgeon should be aware, that the intestines may be strangulated within the abdomen from the following causes: 1. Apertures in the omentum, mesentery, or mesocolon, through which the intestine protrudes. 2. Adhesions, leaving an aperture, in which a piece of intestine becomes confined. 3. Membranous bands at the mouths of hernial sacs, which becoming elongated, by the frequent protrusion and return of the viscera, surround the intestine, so as to strangulate them within the abdomen, when returned from the sac. (See *A. Cooper on Crural Hernia, &c. p.* 85.)

Pott remarks, that "Ruysch gives an account of an impregnated uterus being found on the outside of the abdominal opening; and so do Hildanus and Sennertus. Ruysch also gives an account of an entire spleen having passed the tendon of the oblique muscle. And I have myself seen the ovaria removed by incision, after they had been some months in the groin." (*Vol.* 2.)

The best sources of information on hernia are the following: *Franco, Traité des Hernies, &c.; Lyon,* 1561; *8vo. Littre, Observation sur une Nouvelle Espèce de Hernie; Mem. de l'Acad. des Sciences;* 1700. *Mery; same work;* 1701. *Littre, sur une Hernie Rare; same work;* 1714. *Mauchart de Herniâ incarceratâ; Tubing.* 1722. *Heister, Instit. Chirurg. et De Herniâ Incarceratâ Suppuratâ non semper lethali. Vogel, abhand lung aller arten der bruche; Lips.* 1738. *Peyronie, Observations, &c. sur la Cure des Hernies avec Gangrene; Mem. de l'Acad. de Chir. tom.* 1. *Gunzius, Observationum Anatomico-chirurgicarum de Herniis libellus; Lips.* 1744. *Arnaud on Hernias,* 1748; *also his Mem. de Chir. Haller de Herniis Congenitis,* 1749. *Garengeot, sur plusieurs Hernies singulières; Mem. de l'Acad. de Chir. tom.* 2. *Moreau sur les suites d'une Hernie opérée; Mem. de l'Acad. de Chir. tom.* 3. *Benevoli, una Ernia assai particolare; Firenzo,* 1750. *Haller Herniarum adnotationes; extant. in opuscul. pathol.* 1755. *Blanc Nouvelle Méthode d'opérer les Hernies; avec un essai sur les Hernies, par M. Hoin; Orleans,* 1767; *8vo. Louis, Reflexions sur l'Opération de la Hernie; Mem. de l'Acad. de Chir. tom.* 4. *Hoin, Essai sur les Hernies rares et peu connues;* 1767. *Medical Observations and Enquiries. Pott's Works, vols.* 2 *and* 3. *Goursaud sur la Différence des Causes de l'étranglement des Hernies; Mem. de l'Acad de Chir. tom.* 4. *Le Dran, Traité des Opérations de Chir. et Observations de Chir. obs.* 57. *F. Hildanus, cent.* 5. *obs.* 54. *J. L. Petit, Traité des Mal. Chir. tom.* 2. *Sharp on the Operations, and his Critical Enquiry. Bertrandi Traité des Opérations, et Exemple d'une Hernie formée du côté droit par l'intestin ileum seulement, dont une portion s'étoit echappée par une des échancrures ischiatiques, en se glissant sur les ligaments sacro-sciatiques; Mem. de Chir. tom.* 2. *Saltzmann, Disp. de Vesicæ Urinariæ Herniâ;* 1712. *Mery sur des Descentes de la Vessie; Acad. des Sciences,* 1713. *J. L. Petit sur les Hernies de la Vessie; Acad. des Sciences,* 1717. *Verdier, Recherches sur la Hernie de la Vessie; Mem. de l'Acad. de Chir. tom.* 2. *Divoux, Disp. de Herniâ Vesicæ Urinariæ; Argent.* 1732. *Levret, Obs. sur la Hernie de la Vessie; Mem. de l'Acad. de Chir. tom.* 2. *P. Petit (le jeune) sur les Hernies, de la Vessie, et de l'Estomac; Acad. de Chir. tom.* 4. *Vater de Lienis Prolapsione;* 1746. *Peyronie sur un étranglement de l'intestin, causé intérieurement par l'adhérence de l'epiploon au-dessus de l'anneau; Mem. de l'Acad. de Chir. tom.* 1. *Tenon in Acad. des Sciences;* 1764. *Gunzius, Obs. de Entero-epiplocele. Callisen, System Chirurg. hodiernæ, pars posterior. Richter Vonden Brûchen, in* 2 *vols.* 1778, 1779: *or the French transl. by Rougemont. Also Richter's Bibliothek, and Aufang. der Wundarzn. Wilmer's Pract. Obs. on Herniæ. Schmucker's Chir. Wahrnehmungen. Desault's Œuvres Chirurg. par Bichat. tom.* 2. *Hey's Pract. Observ. in Surgery. Sandifort's Anat. Pathol. Camper's Demonstrat. Anat. Pathol.* 1760; *and his Icones Herniarum, edit. à Soemmerring,* 1801. *Dr. Hunter's Med. Comment.* 1762, 1764. *Monro in Edinb. Med. Essays; and the edition of his works by his Son. Gimbernat's Account of a New Method of operating for Femoral*

*Hernia. A. Cooper on Inguinal and Congenital Hernia; and on Crural and Umbilical Hernia. Munro on Crural Hernia,* 1803. *Sabatier, Médecine Opératoire, tom.* 1. *Chopart and Desault, Traité des Mal. Chir. Desault, Parisian Surgical Journal. Wrisberg in Comment. Reg. Societ. Götting.* 1778. *Schmucker's Vermischte Chir. Schriften. Haller's Opera Minora; and Disputationes Chir. Sull'ernie Memorie anatomico-chirurgiche di Antonio Scarpa,* 1809 *and* 1810; *or the French transl. by Cayol,* 1812, *or the English by Wishart. C. Bell's Surgical Observations, pt.* 2. *p.* 177, *&c. London* 1816. *Richerand's Nosographie Chirurgicale, Tom.* 3. *p.* 354, *&c. Edit.* 2. *Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 1, *&c., Edit.* 1809. *Pelletan Clinique Chirurgicale, Tom.* 3. *Travers on Injuries of the Intestines, &c.* 1812. *Leveillé, Nouvelle Doctrine Chirurgicale, Tom.* 3, *p.* 170, *&c.* 1812. *See also a case of hernia ventriculi through a laceration of the diaphragm by T. Wheelwright in Medico-Chirurgical Trans. Vol.* 6, *p.* 374. *Hesselbach, Disquisitiones Anatomico-Pathologicæ de Ortu et progressu Herniarum Inguinalium et Cruralium, cum tab.* 17 *æneis. Würzburg* 1816: *the original Edition in German was published in* 1806. *Sœmmering über der Nabelbrüche; and his work on the Ursache und Verhutung der Nabel und Leistenbrüche. Francfurt* 1811. *Delpech Précis Elémentaire des Maladies Chirurgicales, Tom.* 2. *p.* 466 *et seq. Paris* 1816. *But, above all, the work, which I feel infinite pleasure in recommending, from a conviction of its superior merit, and practical utility, is a Treatise on Hernia by W. Lawrence; 8vo. the first edit. of which was published* 1807, *and two more editions have appeared since that period, under the title of a Treatise on Ruptures."*

**HERNIA CEREBRI.** (*Fungus Cerebri. Encephalocele.*) There are two principal kinds of hernia cerebri; one presents itself in young infants, before the ossification of the skull is completed; the other takes place after the destruction of a part of the skull by the operation of the trephine, accidental violence, or disease.

The congenital hernia cerebri of infants occurs, however, in two very different forms; in one it is covered by the scalp; in the other, the corresponding integuments of the head, and sometimes even the dura mater, are deficient.

The common encephalocele, met with in new-born children, is that, which seems to originate from the imperfect ossification of the skull, especially in the situation of the fontanella, and sutures. This case is characterized by a soft swelling, of an equal round shape, which is attended with a pulsation corresponding to that of the pulse, which yields and disappears under pressure, which offers no alteration in the color of the skin, and which is circumscribed by the margin of the defective portion of the skull. (*Ferrand, in Mém. de l'Acad. de Chir. T.* 13, *in* 12 *mo. p.* 102.) The mental faculties are not in general affected; and we read of one example, in which a patient had had a hernia cerebri thirty three years, without his intellects ever having been impaired during the whole of that period. (*Op. cit. T.* 5, *in* 4*to. p.* 863.)

It is tolerably well established, that the congenital hernia cerebri, which arises from the incomplete ossification of the skull, and is covered by the scalp, ought to be treated by the application of constant, yet moderate, pressure. M. Salleneuve communicated to the Royal Academy of Surgery in France an example of the good effects of this treatment, which reduces the size of the tumour, and accomplishes a perfect cure as soon as the ossification is completed. M. Salleneuve put a piece of thin sheet lead, properly covered with soft linen, under the child's cap, to which it was sewed in a suitable situation. The degree of pressure could be increased, or lessened, according as circumstances required, by tightening, or loosening the cap. (*Op. cit. p.* 103, *T.* 13, *edit.* 12*mo.*)

The experience of Callisen also confirms, that herniæ cerebri, when of moderate size, may be cured by the foregoing method, the aperture in the skull becoming gradually closed. But, he adds, that large tumours of this description, especially when situated about the occiput, scarcely admit of any means of relief, except the employment of some contrivance to protect them from external injury. (*Callisen, System. Chir. Hodiernæ, Vol.* 2, *p.* 513—514, *Edit.* 1800.)

The cerebellum, as well as the cerebrum, is liable to protrusions, when the ossification of the sutures is backward in children. In the year 1813, two such cases occurred at Paris. In one, Professor Lallement mistook the disease for a common tumour, and commenced an operation for its removal, when, after making some of the necessary incisions, his proceedings were stopped by his seeing the white silvery colour of the dura mater, and that the swelling came out of an aperture in the occipital bone. The day after the operation the child was seized with violent pain in the head, had a hard pulse, prostration of strength, vomiting, &c. and died in the course of a week. On dissection, a part of the tentorium, and an elongation of the two lobes of the cerebellum, about as large as a nut, were found in the protruded sac of the dura mater. Several abscesses were also discovered in the substance of the cerebellum. The other example fell under the observation of M. Baffos, surgeon in chief of the Hôpital des Enfans. Upon the death of the child, the dissection evinced similar appearances to those of the preceding case. (See *Richerand's Nosographie Chirurgicale, Tom.* 2, *p.* 319, *Edit.* 4.)

Such facts should teach the surgeon to be particularly cautious in ascertaining the nature of tumours about the back part of the head, before he ventures to undertake their removal by an operation.

The second kind of congenital encephalocele is that, in which not only large portions of the cranium, but also more or less of the integuments of the head, are deficient. It is rather to be regarded as a malformation, than a disease, and, indeed, in most instances, the infants are still-born. The case sometimes consists of the protrusion of most of the brain through the superior and posterior fontanellæ, so that the child is born with a largish bag, on the back of its head, hanging down over the posterior part of the neck. Several specimens, of these malformations, taken from infants born in the Hospice de la Maternité, are preserved in the Museum of the Faculté de Médecine at Paris. (*Richerand, Nosographie Chirurgicale, T.* 2, *p.* 316, *Edit.* 4.) In the year 1810, a remarkable case of this last description of congenital hernia cerebri was communicated to the Medico-Chirurgical Society of London by Mr. Burrows. "The whole of the forehead, summit, and a great part of the occiput, were deficient, and in lieu of them, a substance projected of a light mulberry colour, and of the mushroom form, except that it was proportionably broader. From the deficiency of bone, the eyes appeared to project much more, than usual.—The child lived six days, without either taking sustenance, or having any evacuation." On dissection, the scalp, the os frontis, the parietal, and a great part of the occipital bones, were wanting. Through the parts, at which these bones were deficient, the cerebrum projected, exhibiting its usual convolutions. It was covered with the pia mater; was of a mulberry colour; appeared to be more vascular, than the pia mater usually is; and the edge of the scalp adhered to the neck of the tumour. The cerebellum was not more than one fourth of its usual size; for, the posterior part of the os occipitis was much nearer to the sella turcica, than natural. The child was destitute of the power of voluntary motion, and all the secretions appeared to be stopped. (See *Medico-Chir. Trans. Vol.* 2, *p.* 52.)

The most interesting species of hernia cerebri to the practitioner, is that which sometimes arises after the removal of a portion of the skull by the trephine, or a destruction of part of it by disease. Various examples of this disease are recorded in the Memoirs of the French Academy of Surgery, and I have myself seen many instances of it. Although the case has attracted considerable notice, modern surgeons are far from entertaining settled opinions concerning the exact nature of this tumour, as we shall presently explain. I take this opportunity, therefore, of recommending such practitioners, as may meet with good opportunities of examining the heads of persons, who have died with this disease, to avail themselves of the occasion, and to communicate to the public a faithful account of their observations. I here more particularly refer to the hernia cerebri, which frequently follows the removal of a part of the skull by the trephine.

Mr. Abernethy has noticed this disease in his ingenious essay on injuries of the head. In one example, recorded by this distinguished surgeon, the hernia cerebri arose on the tenth day after trephining, and was as large as a pigeon's egg. The pia mater, covering it, was inflamed; and a turbid serum was discharged at the sides of the swelling, from beneath the dura mater. On the eleventh day, the tumour was as large as a hen's egg, smooth, and ready to burst. The man died the next day. On examination, the swelling was found still larger, and of a dark colour, with an irregularly granulated surface. This appearance was owing to coagulated blood, which adhered to its surface, as the part had bled so much, that the patient's cap was rendered quite stiff with blood. The pia mater was in general much inflamed, and, as well as the dura mater, was deficient at the place of the tumour. The deeper part of the swelling seemed to consist of fibrous coagulated blood, and it was found to originate about an inch below the surface of the brain.

Mr. Abernethy explains the particular appearances and progress of the disease, as follows: "In consequence of the brain being injured to some depth beneath the surface, disease of the vessels, and consequent effusion of the blood, had ensued; the effusion was, for a time, restrained by the superincumbent brain and its membranes; but, these gradually yielding to the expansive force exerted from within, and at last giving way altogether, the fluid blood oozed out and congealed upon the surface of the tumour." An organized fungus could hardly be produced so rapidly as these tumours are formed. (*Essay on Injuries of the Head, p.* 37.)

Mr. C. Bell contends, however, that such swellings are vascular and organized. (*Operative Surgery, Vol.* 1.)

Dr. John Thomson appears also to entertain a different opinion from Mr. Abernethy, respecting the mode in which these herniæ cerebri are formed; but, I question whether he may not have confounded with the disease now under consideration fungous tumors of the dura mater, which are a totally different affection. At least, some of the cases, which he alludes to as a reason for his sentiment concerning their mode of formation, must have been the disease so well described by M. Louis. (See *Dura Mater.*) The reader, however, must judge for himself from the following passage. "In a considerable number of those, who had the cranium severely contused, or fractured by musket balls, (says Dr. Thomson) fungus growths took place through the openings, which had been made at first by the ball, or afterwards by the trepan. These growths, I am inclined to believe, are the consequence of a contusion of the substance of the brain, and of the membranes that cover it, which gives rise to the formation of a new organized substance, different in its texture from brain; and are not, as some late writers would endeavour to persuade us, simply protrusions of the brain, resulting from the removal of the natural resistance, which is made to them by the dura mater and cranium. *I have known instances of substances, similar to these growths, forming on the surface of the brain, immediately under the place, where the cranium had received a contusion, in cases in which the trepan had not been applied, or any portion of the cranium removed.* Whether, in these cases, the removal of a portion of the cranium, by admitting of the protrusion of the fungi, might not have produced an alleviation of the symptoms of compression, which occurred before death, is a point, which may admit of dispute. For my own part, I cannot conceive in what manner the removal of a portion of the cranium, in cases of that kind, could possibly have done any mischief.

"Fungus of the brain, in the greater number of instances, in which we had an opportunity of observing it, was accompanied either with stupor or paralysis, and other symptoms of compressed brain. In a fracture of the vertex of the cranium, produced by a musket ball, and followed by a fungus of the brain, the paralysis took place in the lower extremities. In a case of wound, made by a musket ball on the right side of the forehead, and in which spicula of bone had been driven in upon the brain, a large fungus protruded. The formation of this fungus was followed by slow pulse, stupor, dilated pupils; slight strabismus, and distortion of the mouth. In the progress of this case, escharotics were applied to the fungus, portions of it were torn off by the patient, and all of it that was exterior to the cranium, was twice pared off by the knife, with an apparent alleviation, rather than aggravation of the symptoms. On the death of this patient, nearly the whole of the right hemisphere of the brain was found converted into a soft pulpy mass. The left hemisphere was not changed in structure, though much vascular turgescence appeared on its surface." (See *Dr. J. Thomson's Report of Observations made in the Military Hospitals in Belgium, p.* 57—58.)

When the bad symptoms disappear, on the tumour being no longer confined by the dura mater, it is best to interfere as little as possible, as the hemorrhage will probably cease, and the tumour drop off in pieces. (See *Edinb. Med. Comment. Vol.* 1. *p.* 98. *Med. Museum, Vol.* 4. *p.* 463.) The mildest dressings alone should be employed, and all pressure avoided.

When the tumour acquires a very great size, it may be pared off with a knife, as was done by Mr. Hill, several times, with success. (*Cases in Surgery.*)

Richerand affirms, indeed, generally, that, when the brain is exposed, in consequence of an injury of the head, the encephalocele should be cut down with a knife, and repressed by soft gentle compression. (See *Nosographie Chir. T.* 2, *p.* 318, *Edit.* 4.)

Should the swelling still increase, and bad symptoms prevail, in consequence of the irritation and pressure on the brain, the opening in the bone ought to be enlarged. Were the bleeding to continue in a dangerous degree, Mr. Abernethy suggests removing the coagulum, to try whether exposure of the cavity would stop the effusion of blood. Quesnay mentions an instance, in which a patient tore off the coagulum himself, and the cavity healed up. (*Mem. de l'Acad. de Chir. tom.* 1.) The danger of applying styptics, and irritating applications, is shewn by Hildanus, *Obs.* 14, and Mr. Hill, *p.* 198. (See *Abernethy on Injuries of the Head.*)

One would suppose, that cases of this kind must generally require the employment of every thing at all likely to keep off, and diminish, inflammation of the brain. Consult Quesnay, sur la Multiplicité des Trépans *in Mém. de l'Acad. Royale de Chirurgie, Tom.* 2, *p.* 25. *p.* 56, *Edit. in* 12*mo. M. Corvin's Dissert. in Haller's Disputat. Chir. vol.* 2. *Mémoire sur l'Encephalocele par M. Ferrand, in Mém. de l'Acad. de Chir. T.* 13, *p.* 96, *edit.* 12*mo. Lassus Pathologie Chirurgicale, T.* 2, *p.* 140, *edit.* 1809. *Abernethy's Essay on Injuries of the Head. Hill's Cases in Surgery. Burrows in Medico-Chir. Trans. vol.* 2. *Callisen's Systema Chirurgiæ Hodiernæ, vol.* 2, *p.* 512, *edit.* 1800. *C. Bell's Operative Surgery, vol.* 1. *Richter's Anfangsgrunde der Wundarzneykunst, b.* 2, *p* 197, *edit.* 1802. *Richerand's Nosographie Chir. T.* 2, *p.* 316, *edit.* 4, *Paris* 1815. *Dr. J. Thomson's Report of Observations made in the Military Hospitals in Belgium, p.* 57. *Edinb.* 1816. *Delpech, Précis Elémentaire des Maladies Chirurgicales, Tom.* 2, *p.* 447 *et seq. Paris* 1816.

**HERNIA HUMORALIS.** (*Swelled or inflamed Testicle.*) A very common symptom, attending a gonorrhœa, is a swelling of the testicle, which is only sympathetic, and not venereal, because the same symptoms follow every kind of irritation of the urethra, whether produced by strictures, injections, or bougies. Such symptoms are not similar to the actions arising from the application of venereal matter; for, suppuration seldom occurs, and when it does, the matter is not venereal. The swelling and inflammation appear suddenly, and as suddenly disappear, or go from one testicle to the other. The epididymis remains swelled, however, even for a considerable time afterwards.

The first appearance of swelling is generally a soft pulpy fulness of the body of the testicle, which is tender to the touch; this increases to a hard swelling, accompanied with considerable pain. The epididymis, towards the lower end of the testicle, is generally the hardest part. The hardness and swelling, however, often pervade the whole of the epididymis. The spermatic chord, and especially, the vas deferens, are often thickened and sore to the touch. The spermatic veins sometimes become varicose. A pain in the loins, and sense of weakness there, and, in the pelvis, are other casual symptoms. Cholicky pains; uneasiness in the stomach and bowels; flatulence; sickness; and even vomiting; are not unfrequent. The whole testicle is swelled, and not merely the epididymis, as has been asserted.

The inflammation of the part most probably arises from its sympathizing with the urethra. The swelling of the testicle coming on, either removes the pain in making water, and suspends the discharge, which do not return, till such swelling begins to subside; or else the irritation in the urethra, first ceasing, produces a swelling of the testicle, which continues till the pain and discharge return; thus rendering it doubtful, which is the cause, and which the effect. Occasionally, however, the discharge has become more violent, though the testicle has swelled; and such swelling has even been known to occur after the discharge has ceased; yet, the latter has returned with violence, and remained as long as the hernia humoralis. (*J. Hunter.*)

Irritation at the mouth of the vasa deferentia has been mentioned as a cause; but, were this true, both testicles would usually be affected at the same time, and the complaint would occur more frequently, when the irritation of the urethra extends far towards the bladder, than when it only reaches about an inch and a half, or two inches, from the orifice of the passage.

Hernia humoralis, with stoppage of the discharge, is apt to be attended with strangury. It is singular, that the inflammation should more frequently come on when the irritation in the urethra is going off, than when it is at its height.

The enlargements of the testicle, from cancer and scrophula, are generally slow in their progress; that of a hernia humoralis very quick. (*J. Hunter.*)

Rest is the best remedy, and the horizontal position of the body is easiest. At all events, the testicle must be well suspended; to which expedient the patient will readily have recourse as soon as he knows the ease it affords. The case is treated as inflammation in general, by bleeding and purging, and applying fomentations and poultices. Leeches have often proved serviceable. The swelling not being venereal, mercury is only useful in removing the induration, continuing after the inflammation has subsided. Vomits have been recommended, and found beneficial. They have even been known to cure the complaint in a surprisingly sudden manner. Opiates are useful. When suppuration occurs, no mercury is requisite, only common treatment.

As the hernia humoralis often appears to depend on the cessation of the discharge, some (*Bromfield*) have advised irritating the urethra with bougies to bring on the gonorrhœa again; but the practice is not followed by the expected good. The introduction of venereal matter into the urethra has also been most absurdly suggested.

A hernia humoralis is at first very quick in subsiding; but, some of the swelling remains a long while, and the hardness and swelling of the epididymis even continue for years, nay, for life. However, no inconvenience attends the mere induration. In such instances, the vas deferens may occasionally be rendered impervious, though the occurrence must be by no means frequent.

Frictions with camphorated mercurial ointment; fumigations with aromatic herbs; and electricity; are the best means for promoting the absorption of the superfluous particles, causing the induration in question. (*J. Hunter.*)

The signs, distinguishing a hernia humoralis from a scrotal rupture, are explained in the article *Hernia.*

I once had under my care a patient with hernia humoralis, whose symptoms were severe in an extraordinary degree; indeed, they very much resembled those of a strangulated hernia. James Shell, aged 24 years, a private in the 2d battalion 9th regiment of foot, was admitted into the detachment Military Hospital, Canterbury, the latter end of May, 1813, for a swelling, which I considered a common inflammation of the testicle. He suffered a good deal of pain in the loins; but, nothing particular occurred the first four days. A bag-truss, cold washes, and purgative medicines were employed, and from these means he seemed to derive relief. On the fifth day after his admission, however, he began to complain of severe pain in various parts of the abdomen ; but, especially, under the right false ribs. The pain was accompanied with almost incessant vomiting ; a return of great uneasiness, and some increase of redness and swelling in the scrotum ; and a remarkable fulness and enlargement of the spermatic cord. I was called to the hospital at four o'clock the following morning, when I found the patient suffering extremely from the preceding complaints ; yet, I noticed that his pulse was but little affected. The pain was intolerably severe both in the scrotum and about the abdomen, and indescribable agony was occasioned by touching the tumour. Sixteen ounces of blood were now taken from the arm, the patient put into the warm bath, and a dose of infus. sennæ and sulphate of magnesia prescribed. As the medicine was soon vomited up, a purging clyster, and a few grains of calomel and extract of colocynth, were given. The clyster was quickly voided without the least appearance of fecal matter. Another was then administered, which proved equally ineffectual. Two drams of the sulphate of magnesia were then directed to be taken every half hour in some peppermint water, until stools were procured. A few drops of the tinctura opii were added to each dose, in the hope of checking the excessive sickness, which every now and then came on.

The sickness and pain in the abdomen continuing, with a full pulse at 84, eight ounces more blood were taken from the arm.

The constipation lasted obstinately the whole day, notwithstanding perseverance in the employment of several active purgatives in large doses ; magnesia sulphas ; extractum colocynthidis comp. ; hydrargyri submurias : and oleum ricini ; assisted by repeated common cathartic clysters.

In the evening, the pulse being yet strong, and the blood already taken away, exhibiting the inflammatory crust, twelve ounces more were drawn from the arm. About nine o'clock in the evening, the pulse had risen to 120. The bowels still continued obstinately constipated, the pain in the swelling and abdomen severe, and the nausea and sickness from time to time recurred.

Although I had never seen hernia humoralis attended with symptoms so much resembling those of a strangulated rupture, and the patient would not own that he had had any gonorrhea, yet I remarked some circumstances in the case, which made me avoid an erroneous judgment. In the first place, I could discover no protrusion from the abdominal ring. Secondly; I observed that there was no tension, nor swelling of the belly, as in common cases of strangulated ruptures. Thirdly ; I remarked, that the inflammation of the scrotum did not increase as the symptoms advanced, as it usually does in the latter disease. Fourthly ; I took notice, that the pain in the belly was most severe under the false ribs on the right side, though at periods it was certainly very diffused ; but, it was never augmented by pressure, as always happens in strangulated hernia, peritonitis, enteritis, &c. from all which disorders, too, the absence of tension seemed to distinguish it. Sometimes likewise the pain was entirely in the tumour ; sometimes altogether in the abdomen.

The patient was directed to take ℥ss. of the oleum ricini in some peppermint water every hour during the night, with a pill of two grains of the hydrarg-submurias, and five grains of the extract of colocynth. Fortunately, the sickness now began to have intermissions, and a good deal of the medicine was retained.

About eight o'clock on the following morning, two scanty stools came away, and these were soon followed by three others. The patient was greatly relieved. The pain in the belly was lessened, and the nausea and sickness were slight compared with what they had been. The pulse was 106. The patient was ordered to take a tablespoonful of the following mixture every half hour:

℞ Magnesiæ sulphatis ℥iss.
Tinct. opii m. xxx.
Aq. menth. pip. ℥iv. Misce.

Suffice it to state further, that the bowels became quite open, and that the bad symptoms gradually subsided under the use of febrifuge medicines, small doses of the sulphate of magnesia, leeches, and cold applications. The disposition to vomit did not, however, entirely cease for some days. When the amendment first shewed itself, a discharge from the urethra commenced.

John Hunter has undoubtedly given the best account of hernia humoralis. (See *his Treatise on the Venereal Disease.*)

**HERPES.** (from ἕρπω, to creep.)

Nothing could be more confused, and undefined, than the idea conveyed by the term *herpes*, as generally employed by medical men before the last few years. In fact, numerous cutaneous diseases, of the most opposite kinds, but which had a tendency to creep, or spread slowly, were designated, as specimens of herpes. Thus, when I first entered the profession, it was common for some of the most eminent surgeons in London frequently to call noli me tangere, or lupus, herpes of the nose ; and to apply the same term to tinea capitis, or the porrigo favosa.

Happily, this vague mode of regarding diseases of the skin is beginning to give way to the judicious distinctions proposed by the late Dr. Willan, and so ably perfected by Dr. Bateman. The appellation, *herpes*, is limited by these physicians "to a vesicular disease, which, in most of its forms, passes through a regular course of increase, maturation, and decline, and terminates in about ten, twelve, or fourteen days. The vesicles arise in distinct, but, irregular clusters, which commonly appear in quick succession, and they are set near together, upon an inflamed base, which extends a little way beyond the margin of each cluster. The eruption is preceded, when it is extensive, by considerable constitutional disorder, and is accompanied with a sensation of heat and tingling, sometimes with severe deep-seated pain, in the parts affected. The lymph of the vesicles, which is at first clear and colourless, becomes gradually milky and opaque, and ultimately concretes into scabs: but, in some cases, a copious discharge of it takes place, and tedious ulcerations ensue. The disorder is not contagious in any of its forms." (See *Bateman's Practical Synopsis of Cutaneous Diseases, p.* 221—222, *Edit.* 3.) This author notices six species of the complaint; viz. herpes phlyctænodes; herpes zoster; herpes circinatus; herpes labialis; herpes præputialis; and herpes iris.

As most of these cases more properly belong to the physician, than surgeon, I shall briefly describe three of them.

According to Dr. Bateman, the *Herpes Zoster*, or *shingles*, is mostly preceded, for two or three days, by languor, and loss of appetite, rigors, headach, sickness, and a frequent pulse, together with a scalding heat, and tingling in the skin, and shooting pains through the chest and epigastrium. Sometimes, however, the precursory febrile symptoms are very slight. Upon some part of the trunk, several red patches occur of an irregular form, at a little distance from each other, upon each of which numerous small elevations appear clustered together. These, if examined minutely, are found to be distinctly vesicular, and in the course of 24 hours, they enlarge to the size of small pearls, and are perfectly transparent, being filled with a limpid fluid. For three or four days, fresh clusters continue to arise, always extending themselves nearly in a line with the first, towards the spine at one end, and towards the linea alba at the other. While the new clusters are appearing, the vesicles of the first lose their transparency, and, on the fourth day, acquire a milky, or yellowish hue, which is soon followed by a blueish, or livid colour, of the bases of the vesicles, and of the contained fluid. They now become somewhat confluent and flatten, or subside. About this time, they frequently break and discharge, for three or four days, a serious fluid, which, at length, concretes into thin dark scabs. These fall off about the 12th or 14th day, leaving the surface of the subjacent skin in a red and tender state; and when the ulceration and discharge have been considerable, numerous cicatrices, or pits, are left. All the clusters go through a similar series of changes.

Young persons, from the age of 12 to 25, are most frequently affected; although aged persons are not altogether exempt from the complaint, and suffer severely from the pain of it. Summer and autumn are the seasons, in which it is most common. Sometimes it supervenes to bowel complaints, and the chronic pains remaining after acute pulmonary diseases. In the treatment, Dr. Bateman thinks gentle laxatives, and diaphoretics, with occasional anodynes, when the severe deep-seated pains occur, all that is necessary. No external application is requisite, unless the vesicles be abraded by the friction of the clothes, which are then liable to adhere to the parts: in this case, a little simple ointment may be interposed. For a fuller account, see *Bateman's Pract. Synopsis, p.* 226, &c.

*Herpes circinatus*, or *ringworm*, makes its appearance in small circular patches, in which the vesicles arise only round the circumference: these are small, with moderately red bases, and contain a transparent fluid, which is discharged in three or four days, when little prominent dark scabs form over them. The central area, in each vesicular ring, is at first free from any eruption; but, the surface becomes somewhat rough, and of a dull red colour, and throws off an exfoliation, as the vesicular eruption declines, which terminates in about a week, with a falling off of the scabs. A succession of these vesicular circles usually arise on the face and neck, or arms and shoulders, thus protracting the case for two or three weeks.

The itching and tingling, which are the only inconveniences of the affection, may be relieved by the application of the popular remedy ink, solutions of the salts of iron, copper, zinc, borax, alum, &c. Some additional interesting observations on other forms of the herpes circinatus, may be found in Dr. Bateman's Synopsis, from which I have extracted the few preceding particulars.

*Herpes Præputialis.* This local variety of herpes was not noticed by Dr. Willan, and we are indebted to Dr. Bateman for a description of it. The complaint begins with extreme itching, and with some sense of heat in the prepuce, on which one or two red patches occur, about the size of a silver penny. Upon these are clustered five or six minute transparent vesicles. In

24 or 30 hours, the vesicles enlarge, become of a milky hue, and lose their transparency; and on the third day, they are coherent, and have almost a pustular appearance. If the eruption is seated on that surface of the prepuce, which is next the glans, so that the vesicles are kept moist, they commonly break about the fourth or fifth day, and form a small ulceration upon each patch. This discharges a little turbid serum, and has a white base, with a slight elevation at the edges; and by an inaccurate, or inexperienced observer, it may be readily mistaken for chancre, more especially, if any escharotic has been applied, which produces irritation, and a deepseated hardness, like that of a true chancre. If not irritated, the slight ulceration begins to heal about the ninth or tenth day. When the patches occur on the outside of the prepuce, the duration of the eruption is shorter, and ulceration does not actually take place.

In the treatment, Dr. Bateman recommends the avoidance of all stimulating, and moist, or unctuous applications; and if the complaint be within the prepuce, he advises the interposition of a little bit of dry lint between the sore and the glans.

As this gentleman has truly remarked, this case is particularly deserving of notice, because it has often been considered and treated as a chancre.

For a great deal more valuable information respecting Herpes, I beg leave to refer the reader to the publications of Drs. Willan and Bateman, and also to the article *Herpes*, written by this last able physician for Dr. Rees's Cyclopædia.

**HORDEOLUM.** (dim. of *hordeum*, barley.) A little tumour on the eye-lid, resembling a barley-corn. *A Stye.* As Scarpa remarks, the stye is strictly only a little boil, which projects from the edge of the eye-lids, particularly often near the great angle of the eye. This little tumour, like the furunculus, is of a dark red colour, much inflamed, and a great deal more painful, than might be expected, considering its small size. The latter circumstance is partly owing to the vehemence of the inflammation producing the stye, and partly to the exquisite sensibility and tension of the skin, which covers the edge of the eyelids. On this account, the hordeolum very often excites fever and restlessness in delicate, irritable constitutions; it suppurates slowly and imperfectly; and, when suppurated, has no tendency to burst.

The stye, like other furunculous inflammations, forms an exception to the general rule, that the best mode, in which inflammatory swellings can end, is resolution. For, whenever, a furunculous inflammation extends so deeply as to destroy any of the cellular substance, the little tumour can never be resolved, or only imperfectly so. This event, indeed, would rather be hurtful, since there would still remain behind a greater or smaller portion of dead cellular membrane; which, sooner or later, might bring on a renewal of the stye in the same place as before, or else become converted into a hard indolent body, deforming the edge of the eyelid.

The resolution of the incipient hordeolum may be effected in that stage of it, in which the inflammation only interests the skin, and not the cellular substance underneath, as is the case on the first appearance of the disease. Now repellent, cold applications are useful, particularly ice. But when the hordeolum has affected, and destroyed, any of the cellular membrane underneath, every topical repellent application is absolutely useless, and even hurtful; and the patient should have recourse to emollient anodyne remedies. The hordeolum and eyelids should be covered with a warm soft bread and milk poultice, which ought to be renewed very often. When a white point makes its appearance on the apex of the little tumour, Scarpa says, the surgeon should not be in a hurry to let out the small quantity of serous matter, which exists between the skin and dead portion of cellular membrane. It is better, that he should wait till the skin, within this white point, has become still somewhat thinner, so as to burst of itself, and give a ready vent, not merely to the little serous matter, but, to all the dead cellular membrane, which constitutes the chief part of the disease. When the contents of the little tumour are slow in making their way outward, through the opening, the surgeon, gently compressing the base of the stye, ought to force them out. After this, all the symptoms of the disease will disappear, and the cavity, left by the dead cellular membrane, in the centre of the little tumour, will be found quite filled up, and healed, in the course of twenty-four hours.

Sometimes, though seldom, this process of nature, destined to detach the dead from the living cellular membrane, only takes place incompletely, and a small fragment of yellow dead cellular substance still continues fixed in the cavity, and hinders the cure. In this circumstance, the further employment of emollient poultices is of little or no service. The surgeon should dip the point of a camel-hair pencil in sulphuric acid, and touch the inside of the stye with it, one or more times, until the sloughy cellular membrane comes away. After this, the small cavity remaining will soon close. Should the eyelid continue afterwards a little swollen and œdematous, this affection may be removed by applying the lotio aquæ litharg. acet., containing a little spirit of wine. Some persons are very often annoyed with this disease. Scarpa imputes this most frequently to a disordered state of the *primæ viæ*, often met with in persons who live on acrid irritating food, and drink too much spirits. (See *Scarpa sulle Malattie degli Occhi, cap.* 2.)

**HOSPITAL GANGRENE.** Although La Motte made cursory mention of hospital gangrene in 1722, under the name of *pourriture*, and stated that it had occurred in the Hôtel-Dieu at Paris, yet the first distinct account of this disease is contained in the 3d vol. of the posthumous works of M. Pouteau, published in 1783. In the year 1788, M. Dussassoy, who succeeded Pouteau as chief surgeon of the Hôtel-Dieu at Lyons, also published a short treatise on the disorder. The first very accurate description in the English language of hospital gangrene, appeared in the sixth volume of the London Medical Journal, printed in 1785. The account is entitled "Observations on the Putrid Ulcer, by Mr. Gillespie, surgeon of the Royal Navy." In the edition of Dr. Rollo's work on Diabetes, published 1797, there is a section on this subject, entitled; "A short account of a morbid poison, acting on sores, and of the method of destroying it." In 1799, Dr. Blane in the 3d edit. of his book on the diseases of Seamen, gave an account of hospital gangrene under the name of malignant ulcer; and Dr. Trotter, in the 2d vol. of his Medicina Nautica, published in the same year, described that affection by the same appellation. In the 3d vol. of his Medicina Nautica, Dr. Trotter has added to his first account several valuable communications, relating to this disease, received from surgeons of the Royal Navy. Mr. John Bell has also made hospital gangrene the subject of particular remark, in the first vol. of his Principles of Surgery, published in 1801. According to Dr. Thomson, two excellent theses have likewise been published on the subject in the University of Edinburgh; the first entitled, "De Gangrena Contagiosa" by Dr. Leslie in 1804; the second by Dr. Charles Johnston, in 1805, under the title of "De Gangrena Contagiosâ Nosocomiale." (See *Lectures on Inflammation, p.* 456—458.)

Professor Thomson's own account of the subject, published in 1813, exhibits the fullest history of the disease, hitherto collected.

M. Delpech has offered some valuable observations on hospital gangrene in his book, entitled "Mémoire sur la Complication des Plaies et des Ulcères connue sous le nom de Pourriture d'Hôpital;" 1815; and the celebrated Boyer has also very recently given a concise and accurate description of the disease. (See his *Traité des Maladies Chirurgicales, Tom.* 1, *p.* 320; *Paris*, 1814.)

Hospital gangrene (says Boyer) is a species of humid gangrene, which attacks in some degree *epidemically* the wounds and ulcers of patients, who happen to be crowded together in an unhealthy place.

Its occasional causes are; the situation of an hospital upon a low marshy ground; the vicinity of some source of infection; the uncleanliness of the individuals, or of the articles for their use; the crowded state of the wards, especially when they are small and badly ventilated; lastly, every thing that tends to corrupt the air which the patients breathe. An infected atmosphere may produce in the most simple wounds unfavourable changes, partly, as Boyer conceives, by its immediate action on the surface of the wound, but, no doubt, principally, by its hurtful influence upon the whole animal economy. The foregoing causes have also sometimes produced alarming and obstinate gangrenes of an epidemic kind, or, at least, a state of the constitution, under the influence of which all wounds and ulcers constantly took on a bad aspect, and were often complicated with the most gangrenous mischief. M. Vigaroux saw such an epidemic disease prevail for twenty months in the two hospitals of Montpellier, and he states, that the most powerful antiseptics were of little avail against the disorder, which often invaded the slightest scratches.

In general, this epidemic species of gangrene is not observed in new-built hospitals, nor in those, which are erected out of the central parts of cities, upon high ground. Hospital gangrene may occur in any season; but, it is most common after the sultry heat of summer. It complicates without distinction every kind of solution of continuity. However, it never attacks those of all the patients in the same ward. It manifests itself in different degrees on the majority of them, and it is remarked, that the more extensive the solution of continuity is, the more it is exposed to the disorder. But, occasionally, the disease is confined to a part of the surface of such solution of continuity, while the rest continues to make progress towards cicatrization. Patients, who have escaped infection once, are not on that account exempt from the danger in future.

A bilious constitution, mental trouble, unwholesome or insufficient food, a scorbutic diathesis, great debility, and fevers of a dangerous type, may become so many predisposing causes of hospital gangrene.

The observations of Pouteau, and those of some other practitioners, convincingly prove, that hospital gangrene may be communicated to the most simple wound, or ulcer, in a subject of the best constitution, and breathing the purest air, by merely putting into contact with such wound, or ulcer, sponges, lint, or charpie, impregnated with the infection of this peculiar disorder. But, this inoculation is conceived to be the more alarming, and to take effect the more quickly, in proportion as patients have been more exposed to the influence of such causes, as are themselves capable of producing the disease, and also in proportion as the kind of constitution predisposes to it.

Although the contagious nature of hospital gangrene has been generally admitted by all the best informed writers on the subject, I ought to notice, that the doctrine was not considered by Dr. Trotter as having a good foundation. Modern authors, however, have not joined this latter gentleman, and both Dr. J. Thomson and Delpech believe, that the disorder is infectious. "The contagious nature of hospital gangrene (says Professor Thomson) appears to me to be sufficiently proved, 1st, By the fact, that it may be communicated by sponges, charpie, bandages, and clothing, to persons at a distance from those infected with it. 2dly, By its having been observed to attack the slight wounds of surgeons, or their mates, who were employed in dressing infected persons; and that, even in circumstances, where the medical men so employed, did not live in the same apartment with the infected. 3dly, By our being able often to trace its progress distinctly from a single individual through a succession of patients. 4thly, by its attacking recent wounds, as well as old sores, and that in a short time after they are brought near to a patient affected with the disease. 5thly, By our being able to prevent the progress of the disease in particular situations, by removing the infected person, before the contagion, which his sores emit, has had time to operate. 6thly, By its continuing long in one particular ward of an hospital, or in one particular ship, without appearing in other wards, or ships, if pains be taken to prevent intercourse between the infected and uninfected." (*Lectures on Inflammation, p.* 484.) But, although there can be no doubt of the disease spreading partly by its contagious nature, it appears to me equally certain, that the number of cases is also often increased by the continued operation of the same causes, which produced the earliest instance of the disorder in any particular hospital.

It is alleged, that, when once a patient has taken the infection, he cannot avoid the consequences, whatever precautions he may adopt. Thus, Boyer informs us, that he has seen hospital gangrene take place in wounded patients, who, in the hope of escaping this epidemic affection, had quitted the infected hospital, and retired to elevated situations, where they breathed the most salubrious air. (See *Traité des Mal. Chir. T.* 1, *p.* 322.)

The first symptoms, which indicate hospital gangrene in a wound, or ulcer, are, a more or less acute pain, and a viscid whitish exudation on the surface of the granulations, which lose their vermilion colour, and present at several points spots of a greyish, or dirty-white hue, resembling venereal ulcers, or aphthæ. These ulcerated points, thus engrafted (as it were) upon the original ulcer, soon spread and join together, so as give to the whole surface of the solution of continuity a grey ash-colour. The surface also becomes more or less indurated, and sometimes bleeds. A red, purplish œdematous circle, of a greater, or lesser extent, is next formed in the surrounding skin. Sometimes, when the patient is of good habit, the causes of infection less active, and the constitution sufficiently strong, the disorder has now a stop put to it. Indeed, as we have already remarked, it may not even extend to the whole surface of the ulcer. But, most frequently, its progress is extremely rapid, and occasionally quite terrifying. The edges of the wound, or ulcer, become hardened and everted, the granulations are large and tumid, being, according to Boyer, swelled up with a considerable quantity of gas. They are afterwards detached in the form of soft reddish sloughs, which, says Boyer, very much resemble the substance of the fœtal brain, when in a putrid state. From day to day, until nature alone, or aided by art, puts limits to the disorder, it invades new parts both in breadth and depth, so that its ravages extend to aponeuroses, muscles, blood-vessels, nerves, tendons, the periosteum, and even the bones themselves.

Inflamed absorbent vessels are sometimes seen, extending from the surfaces affected with hospital gangrene, to the contiguous, or communicating, cervical, inguinal, or axillary glands.

Artery seems to be the texture, which resists most powerfully the destructive action of hospital gangrene, as well as of most other species of mortification. When adhesive inflammation does not occur, hemorrhage is liable to take place, and, in some instances, to prove fatal. Even in cases, in which distinct hemorrhage does not occur, a thin, fetid, bloody sanies is often discharged, and the pus, which is secreted during the separation of the sloughs, is frequently reddened by an admixture of blood. (*Thomson's Lectures, p.* 460.)

When the local disorder has attained the foregoing degree, the whole constitution invariably suffers. The patient loses his appetite; his tongue becomes covered with a whitish fur; febrile symptoms commence; the pulse is small, hard, and irregular; general agitation of the system takes place, with anxiety, restlessness, and a disturbed state of all the functions.

I have also already observed, that fevers of bad type predispose to hospital gangrene. Indeed, the experience of Dr. J. Thomson leads him to think, that the constitutional symptoms mostly precede the local. (See *Lectures on Inflammation, p.* 459.)

The duration of hospital gangrene is various, according to the extent of the wound, or ulcer affected; the constitution of the patient; the impression made by the putrid effluvia on the animal economy; and the intensity of the disorder. Hospital gangrenes have been known to continue more than a month, in which circumstance, the patients seldom recover. In ordinary cases, the wound puts on a favourable appearance again between the sixth and ninth days; and, in slight examples, the amendment is manifested between the third and fifth. Whatever may be the period of the complaint, its wished-for termination is always announced by a diminution of pain; the pus acquiring a white colour, and more consistence, and losing its fetid nauseous smell. The edges of the ulcer subside, while its surface becomes less irregular, and puts on more of the vermilion colour. The red, purplish, œdematous circle, which surrounds the disease, assumes a true inflammatory nature, and the solution of continuity, restored to a simple state, heals up with tolerable quickness, even when the destruction of soft parts is somewhat considerable, unless any fresh untoward circumstances occur to interrupt cicatrization. But, sometimes, when the patient is on the point of being completely well again, his condition is suddenly altered for the worse; ulcerated spots make their appearance on the cicatrix, and these spreading in different directions occasion a relapse, which may happen several times.

The hospital gangrene, which occurred in the Artillery Hospital at Woolwich, and has been described by Dr. Rollo, did not attack specific sores: venereal, scrophulous, and variolous ulcers were not attacked, although the patients lay in the wards, where the disease prevailed.

Professor Thomson admits, that specific sores are less liable to attacks of hospital gangrene, than common wounds and ulcers; but, he declares, that he has frequently seen it attack cancerous and venereal ulcers. (See *Lectures on Inflammation, p.* 460.)

Hospital gangrene must be regarded as a serious complication of wounds and ulcers, since it considerably retards their cure. When, however, the solution of continuity is not extensive, and the constitution good, and in other respects healthy, the disease is not dangerous. In this case, as soon as the sloughs are detached, the ulcer heals up, and leaves a cicatrix accompanied with very little disfigurement. But, when the solution of continuity is large, or of long standing, the disorder commits much greater ravages, renews its attacks repeatedly, and the relapses prove exceedingly obstinate. The same thing is said to happen, when it affects persons labouring under scorbutic or venereal complaints, who are often put into great danger. Hospital gangrene proves particularly dangerous, and mostly fatal, when it complicates large contused wounds, attended with badly fractured bones. All the soft parts of the injured limb are then frequently observed to be progressively destroyed, and the unfortunate patient falls a victim, sometimes to typhoid symptoms attending the complaint, sometimes to frequent hemorrhages, but still more often to hectic complaints, the almost inevitable consequence of long continued profuse suppuration.

The effects of hospital gangrene should be carefully discriminated from those of the scurvy. Ulcers, attacked with hospital gangrene, are not affected in any degree, like scorbutic ulcers, by the use of vegetable diet and lemon-juice, and they occur among men, who are fed upon fresh meat and vegetables, as readily as they do among those, who have been fed altogether upon salt provisions. (*Thomson's Lectures on Inflammation, p.* 482.) Hospital gangrene is almost always accompanied with severe febrile symptoms; but, "as to fevers (says Dr. Lind), it may indeed be doubted whether there be any such as are purely and truly scorbutic. The disease is altogether of a chronic nature; and fevers may be justly reckoned amongst its adventitious symptoms." (*Treatise on the Scurvy, p.* 106.) We may also remark, that, in cases of hospital gangrene, the general symptoms of scurvy are absent, such as soreness and bleeding of the gums, livid blotches and wheals on the fleshy part of the legs, œdematous ankles, &c.

The treatment of hospital gangrene is either preventive, or curative.

With a view of preventing the disorder, it is essential to remove all the causes, which have been specified, as capable of producing it. Thus, the wards, in which the wounded are placed, should not be crowded; they ought to be freely ventilated, and as much detached as possible; the utmost attention to cleanliness should be paid; and every source of infection obviated. The predisposition of the wounded to this species of gangrene may be lessened by a well chosen diet, by drinks acidulated with vegetable acids, or with the sulphuric acid, and by the moderate use of wine. The state of the stomach and bowels should be particularly attended to, and, if found to be out of order, emetics and purgatives ought to be immediately employed, and repeated according to circumstances. In the beginning of the constitutional attack, Pouteau and Dussassois particularly recommended the use of emetics, and Mr. Briggs also found them highly useful. It is by the advantageous use of these remedies, that the tendency to bilious fevers is removed, to which all wounded patients are so liable, who have not been evacuated in time; and which (as Boyer observes) always retard cicatrization, and frequently impart to wounds the most fatal complications. After due evacuations the surgeon should prescribe bitter aromatic decoctions proper to support the tone and functions of the stomach. The dressings should be applied with extreme attention and cleanliness, and too much care cannot be taken to prevent the infectious matter of one wound from coming into contact with another. All fatty resinous applications should likewise be abandoned in the treatment of wounds and ulcers, threatened with hospital gangrene. The dressings, says Boyer, should be of a quality calculated to keep up the tone of the parts, without irritating them. According to this professor, such are the decoction, or simple infusion of aromatic plants in spirit of wine; diluted alkaline lotions, &c. Pledgets, kept constantly wet with these applications, are to be applied to the wound.

Such are the means, which, judiciously resorted to, will prevent hospital gangrene, or, at least, render its occurrence much less frequent. Let us next consider what can be done after the disorder has manifested itself, with a view of assuaging it, before it attains such a degree as puts the patient's life into danger.

No doubt, the most certain mode of arresting the progress, or, at all events, of abridging the duration of the complaint, would be to transport the wounded into a more healthy situation, so as to remove them from an atmosphere, contaminated by putrid contagious effluvia, and in which the disease has had its first formation. But, as Boyer observes, this change of place is generally impossible. In fact, where is the hospital, in which can be found large well ventilated wards in reserve, separated from every source of infection, and into which the patients can be directly moved on the very first appearance of the disorder? The best built hospitals offer no such accommodation. As then the patients cannot usually be transported into a different ward, the air, which they breathe, should be purified, by renewing it as much as possible, fixing ventilators, and especially by using the oxygenated muriatic acid fumigations, as recommended by Guyton-Morveau, or else those of the nitric acid.

The nitric acid fumigations are made by putting into a glass vessel on the ground, half an ounce of concentrated sulphuric acid, to which an equal quantity of nitre is to be added *gradatim.* The mixture is to be stirred with a glass tube, when an abundance of white vapour will be produced.

The oxygenated muriatic acid fumigations are made, by mixing three ounces two drams of common salt with five drams of the black oxide of manganese in powder. These two ingredients are to be triturated together; they are then to be put into a glass vessel; one ounce two drams of water are to be added, and then, if the ward, or chamber be uninhabited, one ounce seven drams of sulphuric acid are to be poured upon the mixture all at once; or, gradually, if the patients are there. This quantity will be sufficient for disinfecting a very large ward. (See *Lassus Pathologie Chirurgicale, Tom.* 1. *p.* 38, 39.)

When one, or more of the patients, afflicted with the disorder, before it has become general, are lying in a badly ventilated part of the ward, or near some source of infection, the surgeon can partly counterbalance the disadvantage of not having a fresh ward, by causing the patients to be put into a more airy part of the ward, and as far as possible from the quarter, in which they contracted the disease. Diet, internal medicines, and topical applications, form the three essential points in the treatment of hospital gangrene, after change of situation, or purification of the air, when that is impracticable.

When hospital gangrene attacks a large wound or ulcer, and the fever attending the complaint is considerable, no solid animal or vegetable food should be allowed. Where more nourishment is required, than can be obtained from slops, tea, &c. thin rice milk, weak gruels, &c. will agree better than broth, or soup, which cannot be digested without considerable disorder. In proportion as the heat and irritation of the system diminish, the rice milk, and gruels, may be made somewhat thicker, and, when the patient can venture to eat solid food, new-laid eggs, baked, or boiled fruits, vegetable dishes, fish, and even, what are called, white meats, may be given. The less meat, however, the patient eats, the less liable will he generally be to a relapse.

With regard to internal medicines, while irritation and febrile heat accompany hospital gangrene, diluent acid drinks are proper, such as nitrated whey sweetened with syrup of violets, lemonade, &c. Bloodletting is admissible in but few instances, not merely because the orifice, made by the lancet, is apt to become gangrenous, but because the fever, which accompanies hospital gangrene, is usually of the typhoid, or asthenic character. (*Thomson, p.* 493.)

When the stomach appears much oppressed with bilious complaints, an emetic ought to be administered. When there is debility, good generous wine should be allowed, either by itself, or mixed with lemonade according to circumstances. Bark, whose antiseptic qualities have been so highly praised, is in general more hurtful, than useful, in this disorder. Boyer, however, allows that it may be beneficially given, when the feverish heat has abated, and the debility is very great. He thinks also that the extract is the best preparation.

Acids are not liable to the same objections as bark: they are proper in all stages of the disease, and their efficacy, which has been proved in a vast number of instances, is the more marked, the greater the doses. The sulphuric acid is that, which is given with most success; but, the acidulous tartrite of potassa is also an excellent medicine. From two drams to half an ounce may be given every day, and the best plan is to make an acid drink with it, which should be sweetened and strained.

In severe cases, attended with a quick and feeble pulse, depression, restlessness, and anxiety, an opiate becomes necessary. "So long as we wish to excite a degree of moisture on the skin, (says Professor Thomson) Dover's powder, or laudanum with antimonial wine, form in general the best opiates." This gentleman, however, is not an advocate for the employment of opium, in the early stage of hospital gangrene, while the heat and other febrile symptoms are at their height. (See *Lectures on Inflammation*, p. 494—495) For these cases, camphor was highly praised by Pouteau.

With respect to the local treatment, it is at least as important as the constitutional. Indeed, the French surgeons conceive, that it is much more so. "I was told by several of the French surgeons (says a late visitor to Paris), that they did not rely at all on internal means for stopping the progress of hospital gangrene, and that their experience had proved them to be insufficient, if not wholly inefficacious. Dupuytren, in reply to the account I gave him of the practice and opinions of English surgeons on this subject, assured me, that he had no confidence but in local applications, and that internal remedies alone, as far as he had found, did almost nothing. The same remark has been made in a very recent publication on hospital gangrene, (*Delpech, Mém. sur la Complication des Plaies, &c.* 1815.) although it seems to be rather at variance with its being a constitutional and contagious disease, which the author has admitted." (See *Sketches of the Medical Schools of Paris, by J. Cross, P.* 83.)

Perhaps, there is not a single antiseptic application, which has not been tried as a dressing for wounds, or ulcers, affected with hospital gangrene. All watery applications, and common poultices and fomentations, are generally condemned, as inefficacious, and even hurtful, in the treatment of this disorder.

M. Dussassoy was convinced by the observation of numerous cases, that the best application is powder of bark. He recommends the wound to be covered with several layers of this powder, which are then to be moistened with turpentine. When this composition dries, it forms a fragile sort of coat, at the sides of which, and through which, the discharge escapes. After twenty-four hours, the first coat is to be removed, and a fresh one applied. In general four, or five, such dressings are sufficient in simple cases, where the disorder is confined to the skin and cellular substance. Healthy inflammation then occurs, the sloughs come away, and the wound puts on a healing appearance.

Dussassoy, in bad cases, sometimes added one fifth of powdered muriate of ammonia to the powder of bark. In mild instances, as we learn from Mr. Cross, the modern surgeons in France also employ with success vegetable and diluted mineral acids (*P.* 84.)

But, when by the employment of these means, and of the other remedies, which have been enumerated, the progress of the disorder cannot be checked, and all the surrounding soft parts are threatened with destruction, Pouteau, Dussassoy, and other French surgeons, even those of the present day, have immediate recourse to the actual cautery, and repeat the application of it, until the whole surface of the ulcer is converted into a firm hard eschar. Even the edges of the solution of continuity should not be spared—"*ils doivent être torréfiés et rôtis pour ainsi dire.*" (*Boyer, Traité des Maladies Chir. T.* 1. *P.* 332.) The eschar is then to be covered with a thick stratum of bark, moistened with turpentine. This application is to be removed, in twenty-four, thirty-six, or forty-eight hours, and the surgeon is then to judge from the appearance of the flesh, and the quality of the discharge, whether a further repetition of the cautery will be necessary.

Although we thus find from the accounts of Boyer, Delpech, Mr. Cross, and others, that the modern French surgeons still regard the actual cautery as the only effectual means for stopping the progress of bad cases of hospital gangrene, their opinion has fortunately not been adopted in this country. Nothing can be a greater proof of such severe practice being at all events unnecessary, than the fact that many bad cases of hospital gangrene have done well without it, and even its greatest advocates cannot presume to assert, that it will always effect a cure.

Instead of the actual cautery, the application of boiling oil has been proposed; but, the advocates for red hot irons maintain, that the heated oil does not extend its action to a sufficient depth.

A phlegmonous swelling at the circumference of the wound, or ulcer, evinces, that the ravages of the disease are stopped, and that suppuration and the detachment of the sloughs are about to follow. In order to promote these desirable changes, Boyer recommends the inflamed parts to be covered with an emollient poultice; but, as soon as pus is secreted, the poultice is to be discontinued, as it might relax too much, and some gently tonic application employed, such as the decoction of bark.

When the sloughs have separated, and the bottom of the ulcer appears firm and of a vermilion color, the rest of the treatment ought to resemble that of a common wound, and the cure then generally follows with tolerable quickness. However, *cæteris paribus*, wounds and ulcers, after an attack of hospital gangrene, heal more slowly, than other solutions of continuity.

But, when after the detachment of the eschars, the wound, instead of presenting a firm vermilion appearance, and discharging healthy pus, is covered with pale flabby granulations, the recurrence of hospital gangrene is to be apprehended. With a view of preventing it, the patient is to be purged with a decoction of tamarinds, which Boyer says is preferable to any thing else, and small doses of the acidulous tartrite of potassa are to be given every other day. But, if the disease returns, the French surgeons direct the cautery to be used again, if the patient be not too much exhausted to bear it; for, when he is, there is no hope from this or any other means. Relapses seldom happen, except in wounds, and ulcers, which are very large, and have confined the patients a long while in the hospital. A relapse, in these cases, is always an unfavourable omen; for, it sometimes proves mortal, and if the patient get over it, still the ulcers, or wounds, which have been repeatedly affected by it, are apt to degenerate into chronic sores, which it is extremely difficult, or even impossible, to heal. (*Boyer, Traité des Maladies Chirurg. T.* 1. *P.* 320, *et seq.*)

By referring to the various publications, published by English surgeons on hospital gangrene, we shall find, that they have frequently succeeded in stopping the disease, without having recourse to that heroic means, (as it is called by M. Roux) the actual cautery. "The fermenting poultice, spirits, and turpentine, (says Professor Thomson) are certainly much milder applications, and will, I am convinced, when judiciously used, be found to be much more efficacious in effecting a cure. If attention to cleanliness, in the dressing of sores and ulcers, be at all times required, it is needless for me to remark to you, how much more imperiously it must be required in hospital gangrene, where the discharge from the sores, and probably the effluvia from the body of the patient, are of a contagious nature." (See *Lect. on Inflammation, P.* 500.)

Besides the fermenting poultice, camphorated spirits, and turpentine, the following local applications seem eligible; viz. decoction of bark; charcoal poultice, especially when the disease is stopped, and the sloughs are separating, the citric acid, with, or without laudanum; vinegar; the diluted mineral acids; the vapours of the nitric, muriatic, and oxygenated muriatic acids; a solution of gum kino in equal quantities of claret and port wine.

Consult *Pouteau's Œuvres Posthumes, Tom.* 3. *published* 1783. *Dussassoy's Essay*, 1788. *Those of Moreau and Burdin*, 1796. *Observations on the Putrid Ulcer by L. Gillespie, in London Medical Journal, Vol.* 6, 1785. *Rollo on Diabetes, Edit. of* 1797. *Blane on the Diseases of Seamen, Edit.* 3, 1797. *Trotter's Medicina Nautica, Vols.* 2, *and* 3, *published* 1799. *John Bell's Principles of Surgery, Vol.* 1, 1801. *Leslie, De Gangrenâ Contagiosa, Edinb.* 1804. *Johnston, De Gangrenâ Contagiosa Nosocomiale, Edinb.* 1805. *Thomson's Lectures on Inflammation, P.* 456, *et seq. Edinburgh*, 1813. *Mémoire sur la Complication des Plaies et des Ulcères connue sous le nom de Pourriture d'hôpital, par J. Delpech;* 1815. *Also his Précis Elémentaire des Maladies Chir. T.* 1, *P.* 123, *&c. Paris*, 1816. *Boyer's Traité des Maladies Chirurgicales, T.* 1, *P.* 320, *Paris*, 1814. *Sketches of the Medical Schools of Paris by J. Cross, P.* 82, *London*, 1815.—The rest of the subject of *Gangrene* is treated of in the article *Mortification.*

**HYDRARGYRIA.** A peculiar eruption occasioned by the use of mercury. (See *Mercury.*)

**HYDROCELE.** (from ὑδωρ, water, and κηλη, a tumour.) The term *hydrocele*, if used in a literal sense, means any tumour produced by water; but surgeons have always confined it to those, which possess either the membranes of the scrotum, or the coats of the testicle and its vessels. The first of these, viz. that which has its seat in the membranes of the scrotum, is common to the whole bag, and to all the cellular substance, which loosely envelopes both the testes. It is, strictly speaking, only a symptom of a disease, in which the whole habit is most frequently more or less concerned, and very seldom affects this part only. The latter, or those which occupy the coats immediately investing the testicle and its vessels, are absolutely local, very seldom affect the common membrane of the scrotum, generally attack one side only; and are frequently found in persons, who are perfectly free from all other complaints.

Dr. Monro, the father, professor of anatomy at Edinburgh, and Mr. Samuel Sharp, were almost the only writers, before Mr. Pott, who sensibly and rationally explained the true nature of these diseases.

### ANASARCOUS TUMOUR OF THE SCROTUM.

It is most frequently only a symptom of a dropsical habit, and very often accompanies both the general anasarca, and the particular collection within the abdomen, called the ascites. This being the case, and the true method of cure consisting in an internal medical process, it has been improperly ranked among the species of hydrocele, though the nature of the contents will certainly admit the use of the word.

"It is (says Pott) an equal, soft tumour, possessing every part of the cellular membrane, in which both the testicles are enveloped, and consequently is generally as large on one side as on the other; it leaves the skin of its natural colour; or, to speak more properly, it does not redden or inflame it; if the quantity of water be not large, nor the distention great, the skin preserves some degree of rugosity; the tumour has a doughy kind of feel; easily receives, and for a while retains, the impression of the fingers; the raphe, or seam, of the scrotum divides the swelling nearly equally; the spermatic process is perfectly free, and of its natural size; and the testicles seem to be in the middle of the loaded membrane. This is the appearance, when the disease is in a moderate degree. But if the quantity of extravasated serum be large, or the disease farther advanced, the skin, instead of being wrinkled, is smooth, tense, and plainly shews the limpid state of the fluid underneath: it is cold to the touch, does not so long retain the impression of the finger, and is always accompanied with a similar distention of the skin of the penis; the preputium of which is sometimes so enlarged, and so twisted, and distorted, as to make a very disagreeable appearance. These are the local symptoms: to which it may be added, that a yellow countenance, a loss of appetite, a deficiency of urinary secretion, swelled legs, a hard belly, and mucous stools, are its very frequent companions.

"The cure of the original disease comes within the province of the physician, and requires a course of internal medicine: but sometimes the loaded scrotum and penis are so troublesome to the patient, and in such danger of mortification, that a reduction of their size becomes absolutely necessary: and at other times, a derivation, or discharge, of the redundant extravasated serum from this part is ordered as an assistant to the internal regimen.

"The chirurgical means in use for this end is called in general scarification; a term, whose precise sense has by no means been settled; by which it has now and then happened, that a general order being given, and the particular method of executing it being left to the choice of those who have not been sufficiently acquainted with this kind of business, much hazard has been incurred, and considerable mischief done, which might have been avoided.

"The means of making this discharge are two, viz. puncture and incision: the former is made with the point of a lancet; the latter with the same instrument, or with a knife.

"The generality of writers on this subject have spoken on the two methods in such a manner that a practitioner, who had seen but little of either, would be inclined to think, that it was a matter of great indifference, which we should make use of; and that the safety and utility of each were equal; which is by no means the case.

"The intention of the use of either is, by a discharge of extravasated serum, to alleviate the present uneasiness; and, by reducing the size of the scrotum, to render it less troublesome, and less likely to mortify. In some few instances, it has indeed happened, that this drain has proved a radical cure of the original disease: but that has been accidental, and is not in general to be expected. The intention is generally palliative; and, if the patient lives, is most likely to require repetition: therefore, if there be any difference between the two methods, with regard either to ease or safety, there can be no doubt which ought to be preferred.

"All wounds of membraneous parts, in anasarcous or dropsical habits, are necessarily both painful and hazardous; they are apt to inflame, are very difficultly brought to suppuration, and will often prove gangrenous in spite of all endeavours to the contrary. But the larger and deeper the wounds are, the more probable are these bad consequences. Simple punctures, with the point of a lancet, are much less liable to be attended by them, than any other kind of wound; they generally leave the skin easy, soft, cool, uninflamed, and in a state to admit a repetition of the same operation, if necessary. Incisions create a painful, crude, hazardous sore, requiring constant care. Punctures seldom produce any uneasiness at all; and stand in need of only a superficial pledget for dressing.

"Now, although there is so very material a difference in the symptoms and trouble attending the two methods, yet is there none in their effect: the communication of the cells of the dartos with each other is so free, through every part of it, that punctures made with the fine point of a bleeding-lancet, into the most superficial of them, will, as certainly and as freely, drain off all the water, as a large incision, without any of its inconveniences or its hazard. Neither the one nor the other will cure the original disease, unless by mere accident: they are both made, with a design to cure only the local one. The same habit and constitution remaining, the same effect will in general follow, and the same relief be again necessary. The ease, the freedom from bad symptoms, or from danger, and the state in which the parts are left, render one method practicable at all times, and capable of being repeated as often as may be thought necessary: the fatigue, pain, confinement and hazard, which most frequently attend the other, make one experiment in general as much as most people choose to submit to, or indeed have an opportunity of complying with."

Mr. Pott afterwards remarks: "If we consider the preceding complaint as merely symptomatic; and do not rank it among the different kinds of hydrocele, there will then remain only three, viz.

"1. That which consists of a collection of water in the cells of the tunica communis, or cellular membrane, enveloping and connecting the spermatic vessels.

"2, That which is formed by the extravasation of a fluid, in the same coat as the former, but which, instead of being diffused through the general cellular structure of it, is confined to one cavity or cyst, in which all the water constituting this species of disease is contained; the rest of the membrane being in its natural state.

"3. That which is produced by the accumulation of a quantity of water, in the cavity of the tunica vaginalis testis.

"These three are distinct, local, and truly within the province of surgery. They may accidentally be combined or connected with other disorders, but not necessarily; and are frequently found in persons whose general habit is good, and who are perfectly free from all other complaints."

### THE HYDROCELE OF THE CELLS OF THE TUNICA COMMUNIS.

"The spermatic vessels, from their origin quite down to the insertion into the testicle, are enveloped in, and connected together by, a membrane, called formerly tunica vaginalis vasorum spermaticorum, but now (more properly) tunica communis. This membrane, so enveloping the spermatic vessels, has no one particular cavity, (as its old name would seem to imply;) but is merely cellular, as either the inflation of air or the extravasation of a fluid, will always prove. While it is within the cavity of the belly, its cells are lax and large; and when it has passed out from thence, and has formed a part of the spermatic process, by enveloping its vessels, its cells are rather smaller, and the membrane composing them, firmer. It is included within that thin expansion of muscular fibres, called the cremaster. And a great number of lymphatics, passing from the testicle to the receptaculum chyli, are always to be found in it.

"An attentive consideration of these circumstances in the structure of this part will shew us, (continues Pott) why either obstruction or breach of the lymphatic vessels, considerable pressure by means of diseased indurations within the abdomen, or a morbid state of the parts which should receive the lymph from the vessels of the spermatic cord, may induce the disease in question; and also, when it is produced, that its appearance, and the nature of the extravasation, must make the term *cellular* a very proper one, as expressive of its true state.

"When the disease is simple, it is perfectly local; that is, it is confined entirely to the membrane forming the tunica communis; and does not at all affect, either the scrotum, the tunica vaginalis testis, or any other part."

According to Pott, it does not give a great deal of trouble, unless it arrives to a considerable size; and, being by no means so frequent as either of the other two kinds of hydrocele, it is in general but little known or attended to. With some, it passes for a varix of the spermatic cord; with others, for the descent of a portion of omentum, which, having contracted an adhesion, cannot be returned. Thus, its true nature not being in general rightly understood, and it giving but little trouble or uneasiness while it is within moderate bounds, and neither hindering any necessary action or faculty, they who have it are most frequently advised to be contented with a suspensory bandage, and find very little inconvenience from it.

"Sometimes it arises to so large a size, and gets into such a state, as to become an object of surgery, and to require our very serious attention.

"In general, (says Pott) while it is of moderate size, the state of it is as follows. The scrotal bag is free from all appearance of disease; except that when the skin is not corrugated, it seems rather fuller, and hangs rather lower on that side than on the other, and if suspended lightly on the palm of the hand, feels heavier: the testicle, with its epididymis, is to be felt perfectly distinct below this fulness, neither enlarged, nor in any manner altered from its natural state: the spermatic process is considerably larger than it ought to be, and feels like a varix, or like an omental hernia, according to the different size of the tumour: it has a pyramidal kind of form, broader at the bottom than at the top: by gentle and continued pressure it seems gradually to recede or go up, but drops down again immediately upon removing the pressure; and that as freely in a supine, as in an erect, posture: it is attended with a very small degree of pain or uneasiness; which uneasiness is not felt in the scrotum, where the tumefaction is, but in the loins.

"If the extravasation be confined to what is called the spermatic process, the opening in the tendon of the abdominal muscle is not at all dilated, and the process passing through it may be very distinctly felt; but if the cellular membrane, which invests the spermatic vessels within the abdomen, be affected, the tendinous aperture is enlarged; and the increased size of the distended membrane passing through it, produces to the touch, a sensation, not very unlike that of an omental rupture.

"While it is small, it is hardly an object of surgery; the pain or inconvenience which it produces being so little, that few people would chuse to submit to an operation to get rid of it; and it is very seldom radically curable without one: but when it is large, or affects the membrane within the cavity, as well as without, it becomes an apparent deformity, is very inconvenient both from size and weight, and the only method of cure which it admits is far from being void of hazard. The plan is to make a free incision into the swelling." (*See Pott on Hydrocele.*)

### THE ENCYSTED HYDROCELE OF THE TUNICA COMMUNIS.

"This species of hydrocele (Pott remarks) has its seat in the same part as the preceding, viz. the tunica communis, or cellular membrane, which invests the spermatic vessels; with this difference, that, in the former, the water is diffused in general through all the cells of the membrane; whereas, in this, it is contained in one cavity only. If any of the three kinds of hydrocele deserve the name of encysted, it is this. The water, which constitutes it, being all contained in a bag, formed in the same manner as all the coats of all encysted tumours are, viz. by mere pressure and condensation of the common membrane.

"It is a complaint by no means infrequent, especially in children. It was very well known to many of the ancients, and has been very accurately described by Albucasis, Celsus, Paulus Ægineta, &c.; but later writers have often mistaken it for, and represented it as, a species of wind-rupture, or pneumatocele; a disease existing in their imaginations only. It most frequently possesses the middle part of the process, between the testicle and groin, and is generally of an oblong figure; whence it has by some people been compared to an egg, by others to a fish's bladder. Whether it be large or small, it is generally pretty tense, and consequently the fluctuation of the water within it, not always immediately or easily perceptible; for which reason it has been supposed to contain air only. It gives no pain, nor (unless it be very large indeed) does it hinder any necessary action. It is perfectly circumscribed; and has no communication, either with the cavity of the belly above, or that of the vaginal coat of the testicle below it. The testis and its epididymis, are perfectly and distinctly to be felt below the tumour, and are absolutely independent of it. The upper part of the spermatic process in the groin is most frequently very distinguishable. The swelling does not retain the impression of the fingers; and when lightly struck upon, sounds as if it contained wind only. It undergoes no alteration from change of the patient's posture; nor is affected by his coughing, sneezing, &c. and has no effect on the discharge per anum.

"These marks (while the disease is simple and uncombined with any other) are sufficient to distinguish it by, from all others which may affect the same part; but it sometimes happens, that the present complaint is found connected either with a true hernia, or with a hydrocele of the tunica vaginalis; by which the case is rendered complex, and less easy to be understood.

"In this, as in every other case where, from a complication of symptoms and appearances, a combination of diseases may be suspected, there is but one method of investigating the truth; which is, to consider carefully what disorders the part aggrieved is naturally liable to; what the distinct symptoms and appearances of each of those are; and what are the effects of the present complaint. The two diseases with which this kind of hydrocele is most likely to be combined are, an hydrocele of the tunica vaginalis testis, and a true hernia; the parts within the groin, the spermatic process, and the scrotum being the seat of all three.

"One mark, or characteristic of an hydrocele of the tunica vaginalis testis is, that it possesses and distends the inferior part of the scrotum; and that the testicle being nearly (though not absolutely) surrounded by the water, it very seldom happens, that the former can be clearly and plainly distinguished by the fingers of an examiner; whereas, in the encysted collection, in the membranes of the cord, the tumour is always above the testicle, which is obvious and plain to be felt below it.

"Another circumstance worth attending to is, that although the fluid in a hydrocele of the vaginal coat does so nearly surround the testis as to render it often not very easy to be distinguished, yet the different parts of the tumour have always a very different feel: for instance, in all those points where the vaginal tunic is loose, and unconnected with the tunica albuginea, the tumour is soft and compressible, and gives a clear idea of the contained fluid; but when these two coats are continuous, or make one and the same membrane, and have no cavity between them (which is the case on the middle and posterior part) there will always be found a hardness and firmness very unlike to what is to be found in all those places, where the distance between the two tunics leaves room for the collection of a fluid; now the hydrocele of the cord being formed in the mere cellular membrane of it, is the same to the touch in all the parts of the tumour, and feels like a distended bladder through every point of it.

"The free state of the upper part of the spermatic process, while the tumour is forming below; the gradual accumulation of the fluid, and consequently the gradual growth of the swelling; the indolent and unaltering state of it; its being incapable of reduction, or return into the belly from the first; its being always unaffected by the patient's coughing, or sneezing; and the uninterrupted freedom of the fecal discharge per anum, will always distinguish it from an intestinal hernia; and he who mistakes it for an omental one, must be very ignorant, or very heedless.

"Now, although there may not always be such external marks as may, to the eye, explain the combination of these diseases with each other; yet the particular seat and symptom of each being known, and the sensations which they produce to the fingers of an intelligent examiner being well understood, when such mixed characteristics are found in the same subject, we may reasonably conclude the case to be complex, and act accordingly.

"I have indeed seen an encysted hydrocele, situated so high toward the groin, as to render the perception of the spermatic vessels very obscure, or even impracticable; but then, the state and appearance of the testicle, and the absence of every symptom proceeding from confinement of the intestinal canal, were sufficient marks of the true nature of the complaint.

"Infants are much more subject to this disease than adults; though it often affects the latter.

"In young children, it frequently dissipates in a short time, especially if assisted by warm fomentation, and an open belly.

"If it does not disperse, that is, if it be not absorbed, the point of a lancet will give discharge to the water; and, in young children, will most frequently produce a cure: but in adults, the cyst formed by the pressure of the fluid does sometimes become so thick, as to require division through its whole length; which operation may in general be performed with great ease, and perfect safety." Mr. Pott says, in general, because it is most frequently so: though he has seen even this, slight as it may seem, prove troublesome, hazardous, and fatal. (See *Pott on Hydrocele*.)

Sir James Earle has proposed curing this case, in the same way as the hydrocele of the tunica vaginalis, viz. by an injection of red wine and water. This gentleman has succeeded in this manner himself. (See *Earle on Hydrocele, p. 154, edit. 2.*)

### HYDROCELE OF THE TUNICA VAGINALIS TESTIS.

"The third species of this disease, (as Pott describes) is that which is confined to the vaginal coat, or bag, which loosely envelopes the testicle. In a natural, healthy state, its cavity always contains a small quantity of a fine fluid, exhaled from capillary arteries, and constantly absorbed by vessels appointed for that purpose.

"This fluid, in the natural small quantity, serves to keep the tunica albuginea moist, and to prevent a cohesion between it and the vaginalis; a consequence, which almost necessarily follows any such diseased state of these parts, as prevents the due secretion of it. On the contrary, if the quantity deposited be too large, or if the regular absorption of it be by any means prevented, it will be gradually accumulated, and, by distending the containing bag, will form the disease in question."

It is a disease from which no time of life is exempt; not only adults are subject to it, but young children are frequently afflicted with it; and infants sometimes born with it. What is the immediately producing cause, Mr. Pott will not take upon him to affirm. Ruysch is of opinion, that it proceeds from a varicose state of the spermatic vessels. What real foundation there may be for such conjecture, Mr. Pott cannot say; certain it is, that the spermatic vessels are very frequently found varicose in persons afflicted with this kind of hydrocele; but whether such state of these parts ought to be regarded as a cause, or as an effect of the disease, is a matter worth enquiring into.

"In Morgagni, are some observations on the state of the parts concerned, particularly the inside of the tunica vaginalis, and outside of the albuginea; which, if repeated and confirmed, may possibly lead us on to farther information.

"Whatever tends to increase the secretion of the fluid into the sacculus, beyond the due and necessary quantity, or to prevent its being taken up, and carried off, by the proper absorbent vessels, must contribute to its production; which is so slow, and gradual, and at the same time so void of pain, that the patient seldom attends to it, until it has arrived to some size. Not but that it sometimes is produced very suddenly; and in a very short space of time attains considerable magnitude.

"The size and figure of the tumour (continues Pott) are various in different people, and under different circumstances. In general, at its first beginning, it is rather round; but as it increases, it frequently assumes a pyriform kind of figure, with its larger extremity downward; sometimes it is hard, and almost incompressible; so much so, that, in some few instances, it has been mistaken for an induration of the testicle: at other times, it is so soft and lax, that both the testicle, and the fluid surrounding it, are easily discoverable. It is perfectly indolent, in itself; though its weight does sometimes produce some small degree of uneasiness in the back. The transparency of the tumour, the great characteristic (as it is called) of this disease, and on which almost all writers have agreed to lay the greatest stress, and to rest their proof of the nature of the disorder, is, according to Pott, the most fallible, and uncertain sign belonging to it: it is a circumstance which does not depend upon the quantity, colour, or consistence of the fluid constituting the disease, so much as on the uncertain thickness, or thinness of the containing bag, and of the common membranes of the scrotum.

"If (adds this celebrated writer) they are thin, the fluid limpid, and the accumulation made so quick as not to give the tunica vaginalis time to thicken much, the rays of light may sometimes be seen to pass through the tumour: but this is accidental, and by no means to be depended upon. Whoever would be acquainted with this disorder, must learn to distinguish it by other, and those more certain marks; or he will be apt to fall into very disgraceful, as well as pernicious blunders. The colour of the fluid is very different and uncertain; sometimes it is of a pale yellow, or straw-colour; sometimes it is inclined to a greenish cast; sometimes it is dark, turbid, and bloody; and sometimes it is perfectly thin and limpid.

"In the beginning of the disease, if the water be accumulated slowly, and the tunica vaginalis thin and lax, the testicle may easily be perceived; but if the said tunic be firm, or the water accumulated in any considerable quantity, the testis cannot be felt at all; and other symptoms, or marks, must be attended to. In most cases, the spermatic vessels may be distinctly felt at their exit from the abdominal muscle, or in the groin; which will always distinguish this complaint from an intestinal hernia, the disease which it is most likely to be confounded with. It does indeed now and then happen, that the vaginal coat is distended so high, and is so full, that it is extremely difficult, nay, almost inpossible, to feel the spermatic process: and it also sometimes happens, that the same kind of obscurity is occasioned by the addition of an encysted collection of water in the membrane of the cord; or by the case being combined with a true enterocele. These circumstances are not very frequent, but yet do occur often enough to render it well worth while to mention them; and to signify that, when they are met with, recourse must be had to other marks.

"The two coats of the testicle, the tunica vaginalis and tunica albuginea, are so inseparably united at the posterior and superior, or rather the posterior and middle part of the tumour, that no fluid can collect between them; and, in operating, a puncture, or incision, made here, cannot only do no service, as it cannot reach the water, but must injure the testicle, or epididymis, and do great mischief.

"This natural connexion, between the two tunics, at the upper and hinder part, is the reason (says Pott) why, in a simple hydrocele, that part of the tumour feels so very unlike to every other. In that, the tunica albuginea, and vaginalis, being immediately continuous, no water can get between them; and therefore, the fingers of an intelligent examiner must immediately discover the firmness and hardness arising from the union of these parts; in all others, the two membranes being unconnected, and affording a void space for the collection of water, the fluctuation of it will always be distinguishable.

"This must for ever discriminate the

simple hydrocele of the tunica vaginalis, from the anasarcous swelling of the scrotum; from the encysted hydrocele of the cord; and from the intestinal hernia. The first is every where equal, tumid and soft; and every where equally receives and retains the impression of the fingers; the second, though circumscribed, not very compressible, and affording the sensation of fluctuation, yet does not pit, and is alike to the touch in all parts of it; and in the third, if the testicle be distinguishable at all, it is found at the inferior part of the whole tumour.

"An indurated or scirrhous testicle (continues this author) has indeed, very frequently, a quantity of fluid lodged in its vaginal coat (hydro-sarcocele;) which is a circumstance (says Pott) not to be wondered at; the diseased state of the gland being sufficient to account for the non-execution of the absorbent faculty, and consequently, for the collection of the water. But although part of this mixed tumour is undoubtedly owing to a fluid, and such fluid as is lodged within the vaginal coat, yet it is a very different disease from the true simple hydrocele, and ought not to be confounded with it; one of these marks of the latter being the natural, soft, healthy state of the testicle; and the characteristic of the former, being its diseased and indurated enlargement."

Mr. Pott does not mean that, in a true simple hydrocele, the testicle is never altered from its natural state. He knows the contrary, and that it is often enlarged in size, and relaxed in structure, and that the spermatic vessels are frequently varicose. But, the testicle is never indurated. These two diseases are extremely unlike each other, and require very different treatment. That which would cure a simple hydrocele, would dangerously aggravate the hydro-sarcocele.

Mr. Pott observes, that "it may, and does sometimes become necessary to let out the water from the vaginal coat of a testicle, in some degree diseased; but this should always be done with caution, and under a guarded prognostic; lest the patient be not only disappointed, by not having that permanent relief, which, for want of better information, he may be induced to expect; but be also (possibly) subjected to other unexpected inconveniences from the attempt.

"When the disease is a perfect, true, simple hydrocele, the testicle, though frequently somewhat enlarged, and perhaps loosened in its vascular texture, is nevertheless sound, healthy, and capable of executing its proper office; neither is the spermatic cord any way altered from a natural state, except that its vessels are generally somewhat dilated; neither of which circumstances are objections either to the palliative or radical cure of the disease. But in those disorders, which in some degree resemble this, the case is different; either the testicle, or spermatic cord, or both, bearing evident marks of a diseased state.

### METHODS OF CURING THE HYDROCELE OF THE VAGINAL COAT.

"The methods of cure (says Pott) though various, are reducible to two, (viz.) the palliative, or that which pretends only to relieve the disease in present, by discharging the fluid; and the radical, or that which aims at a perfect cure, without leaving a possibility of relapse. The end of the former is accomplished by merely opening the containing bag in such manner as to let out the water: that of the latter cannot be obtained, unless the cavity of that bag be abolished, and no receptacle for a future accumulation left. One may be practised at all times of the patient's life, and in *almost* any state of health and habit: the other lies under some restraints and prohibitions; arising from the circumstances of age, constitution, state of the parts, &c.

"The operation by which the fluid is let out, is a very simple one. The only circumstances requiring our attention in it, are, the instrument wherewith we would perform it; and the place or part of the tumour, into which such instrument should be passed.

"The two instruments in use, are the common bleeding-lancet, and the trocar.

"The former having the finer point, may possibly pass in rather the easier, (though the difference is hardly perceptible) but is liable to inconveniences, to which the latter is not. The trocar, by means of its cannula, secures the exit of the whole fluid without a possibility of prevention; the lancet cannot. And therefore it frequently happens when this instrument is used, either, that some of the water is left behind; or that some degree of handling and squeezing is required for its expulsion; or, that the introduction of a probe, or a director, or some such instrument, becomes necessary for the same purpose. The former of these may in some habits be productive of inflammation: the latter prolongs what would otherwise be a short operation, and multiplies the necessary instruments; which, in every operation in surgery, is wrong. To which it may be added, that if any of the fluid be left in the vaginal coat, or insinuates itself into the cells of the scrotum, the patient will have reason to think the operation imperfect, and to fear that he shall not reap even the temporary advantage which he expected. The place where this puncture ought to be made, is a circumstance of much more real consequence; the success of the attempt, the ease, and even sometimes the safety of the patient, depending upon it.

"All the anterior and lateral parts of the vaginal coat are loose and detached from the albuginea; in its posterior and superior part, these two tunics make one; consequently the testicle is, as it were, affixed to the posterior and superior part of the cavity of the sac of an hydrocele; and consequently, the water or fluid can never get quite round it. This being the state of the case, the operation ought always to be performed on that part of the tumour, where the two coats are at the greatest distance from each other, and where the fluid must therefore be accumulated in the largest quantity; and never on that part of it where the fluid cannot possibly be. The consequence of acting otherwise, must not only produce a disappointment, by not reaching the said fluid; but may prove, and has proved, highly and even fatally mischievous to the patient.

"After performing this operation, present practitioners content themselves with a bit of lint, and a plaster; and if the scrotum has been considerably distended, they suspend it in a bag truss; and give the patient no farther trouble.

"In most people, (continues Pott) the orifice thus made heals in a few hours, (like that made for blood-letting;) but in some habits and circumstances, it inflames and festers: this festering is generally superficial only, and is soon quieted by any simple dressing; but it sometimes is so considerable, and extends so deep, as to affect the vaginal coat, and by accident produce a radical cure. Mr. Pott has also seen it prove still more troublesome, and even fatal: but then the circumstances both of the patient, and of the case, have been particular.

"Wiseman and others have advised deferring the puncture, till a pint of fluid has collected. When there is a sufficient quantity, however, to keep the testicle from the instrument, there can be no reason for deferring the discharge; and the single point on which this argument ought to rest, is this: Whether the absorbent vessels, by which the extravasation should be prevented, are more likely to reassume their office, while the vaginal coat is thin, and has suffered but little violence from distention; or after it has been stretched and distended to ten or perhaps twenty times its natural capacity; and by such distention is (like all other membranes) become thick, hard, and tough? Mr. Pott thinks the probability so much more on the side of the former, that he should never hesitate a moment about letting out the water, as soon as he found, that the puncture could be made securely. And from what has happened within the small circle of his own experience, he is inclined to believe, that if it was performed more early than it generally is, it might sometimes prevent the return of the disease."

The palliative cure should in general be performed at least once on those, who determine to undergo a radical one, as it gives an opportunity of examining the state of the testis, and also of permitting the cavity to be filled again only to such a size, as may be thought to be best calculated to insure success in any future operation. (*Sir James Earle on the Hydrocele, p.* 13, *edit.* 2.)

Upon the subject of performing the operation of tapping hydroceles, Professor Scarpa gives us some useful cautions. The analogy, which exists between large scrotal herniæ and hydroceles of considerable size, led this writer to suspect, that, in the latter disease, the displacement and separation of the vessels of the spermatic cord from each other might also happen. Careful investigations, made upon the dead subject, fully justified the conjecture. In all considerable hydroceles, he found the spermatic vessels so displaced and separated, that the artery and vas deferens were ordinarily situated on one side of the tumour, and the veins on the other. Sometimes these vessels all extended over the lateral parts of the tumour, as far as its anterior surface, principally towards the bottom.

It is well known, that, in many instances, the operation of puncturing a hydrocele has been followed by a large extravasation of blood within the tunica vaginalis; but, Scarpa informs us, that until lately, he was unacquainted with any case of this kind, which was well detailed and authentic enough, to be cited as an example of injury of the spermatic artery in the puncture of a hydrocele. This learned Professor, however, has had such a fact recently communicated to him by Gasparoli, a distinguished surgeon of Pallanza, who, in introducing the trocar into the lower part of the swelling, had the misfortune to injure the spermatic artery, and the patient was afterwards castrated. The wound of this vessel was most clearly proved by the particulars of the case, as detailed in Scarpa's work, to which I must refer the reader.

"From the accurate knowledge, (says Scarpa) which we now have upon this pathological point, such an accident may be avoided, by observing the rules, which are elsewhere given for opening the sac of a very large scrotal hernia. In this last operation, as well as that of puncturing an old and voluminous hydrocele, care must be taken to introduce the instrument at a considerable distance from the bottom of the tumour, that is to say, a little below its middle part, and on a line, which would divide the swelling longitudinally into two perfectly equal parts. Experience proves, that, for the purpose of completely emptying an hydrocele, it is unnecessary to make the puncture very near the bottom of the tumour. The corrugation of the scrotum, and a slight pressure, made by the surgeon's hand, will suffice for discharging all the fluid contained in the tunica vaginalis, even when the puncture is made at the middle part of the swelling. (*Scarpa, Traité des Hernies, p.* 64—68.)

### RADICAL CURE OF THE HYDROCELE.

Six different operations have been practised for this purpose; viz. the incision, the excision, the application of caustic, the introduction of a tent, the employment of a seton, and injecting some stimulating fluid into the cavity of the tunica vaginalis.

The principle, on which the success of every plan of this kind depends, is the excitement of such a degree of inflammation in the tunica vaginalis, and tunica albuginea, forming the cavity which contains the water, as shall end in a mutual and general concretion of those membranes with each other, by which, it is evident, the receptacle for a future accumulation of fluid is completely obliterated.

All the above plans are not equally eligible. Some of them, indeed, are now quite exploded; some, which are still practised by a few, are not more successful, though certainly more severe, than one, which will be presently recommended; others are very uncertain in their effect, as well as painful.

### *Incision.*

Making an incision, so as to lay open the cavity containing the fluid, is the most ancient method, being described by Celsus. Paulus Ægineta says, the incision is to commence at the middle of the tumour, and be carried to the upper part of it, in a line parallel to the raphe. This incision is only to go through the integuments; the bag, which contains the water, is then to be opened, and part of the sides of the sac taken away. A director is next to be introduced, and a division of the tunica vaginalis made to the bottom of the swelling. The cavity is afterwards to be dressed with lint, and healed by granulations. Hildanus, Dodonæus, Wiseman, Cheselden, Heister, and Sharp, all coincide in stating the dangerous and even fatal consequences sometimes following this mode. Mr. B. Bell, who preferred this operation to every other one, acknowledges that he has seen it produce great pain and tension of the abdomen, inflammation, and fever. Pott observes, that it can never be said to be totally void of danger, and that it bears the appearance of an operation of some severity. This eminent surgeon abandoned the method, during the last twenty-six years of his life. Severe as it is, it has also been known to fail, as Sabatier and Earle have confirmed.

### *Excision.*

Albucasis gave the first clear account of this operation, though Celsus has certainly mentioned removing some of the sac. White and Douglas used to adopt this method. The latter advises making two incisions, so as to form an oval, from the upper to the lower part of the tumour; dissecting off the oval piece of the scrotum, and then making an opening into the sac, and enlarging it with scissars. The tunica vaginalis was next to be entirely cut away, close to where it is connected with the spermatic vessels. The cavity was afterwards filled with lint. Sir James Earle justly notices, that this plan must have been tedious, exquisitely painful in the performance, and, as subsequently treated, attended with violent and dangerous symptoms.

### *Caustic.*

Paulus Ægineta advises destroying the skin with a cautery of a particular form, dissecting off the eschar, and then cauterizing the exposed membrane. Guido di Cauliaco is, perhaps, the first who described the application of caustic for the cure of the hydrocele. Wiseman practised this method. Dionis advises it; but De la Faye and Garengeot make objections to it. Mr. Else has left the best account of the manner of using caustic. He recommends laying "a small caustic upon the anterior and inferior part of the scrotum, which is intended to affect, and, if possible, penetrate through the tunica vaginalis."

The objections to the employment of caustic are, its causing an unnecessary destruction of parts, and producing a tedious painful sore. The action of caustic can never be so regulated as to make an opening with certainty through the tunica vaginalis, so that either its application must sometimes be repeated, or else a lancet, or trocar used after all. Its success is also less sure, than that of an injection; but, it is preferable to all the other methods, except this latter, and, perhaps, the seton.

### *Tent.*

This is first mentioned by Franco. The operation consists in making an opening into the tunica vaginalis, and keeping the wound open with a tent of lint, linen, or sponge, so as to make the cavity suppurate, in which the water was contained. Pare, Guilleman, Covillard, Ruysch, Heister, and Marini, have all described the plan, with some variations, one of which consisted in smearing the tents with irritating substances. The famous Monro devised the plan of keeping a cannula in the tunica vaginalis; so as to bring on a cohesion of the parts, without suppuration. Fabricius ab Aquapendente, however, has made allusion to some surgeons before him, who used to keep the wound open a few days with a cannula. Mr. Pott tried the cannula, but found it very inconvenient, as its inflexibility hurt the testis whenever the patient moved with inattention, and, consequently, he preferred a tent, or bougie, though he speaks of the plan as a very uncertain one.

Of late, M. Larrey, in consequence of having seen several instances, in which the symptoms, following the use of an injection, were violent, and one case, in which a fatal peritonitis was produced by this mode of treatment, has recommended, exciting the necessary degree of inflammation by keeping a short piece of an elastic gum catheter in the puncture, which instrument also serves afterwards to let any fluid escape from the tunica vaginalis. (*Mem. de Chirurgie Militaire, Tom.* 3. *p.* 409, *&c.*) This author, of course, speaks of the plan as having fully answered his expectations; but, I much doubt, whether it has any particular superiority over several of the former methods of employing the tent; methods, which the wisdom, arising from past experience, has long since rejected.

### *Seton*

Is first mentioned by Guido di Cauliaco, 1363, as a means of curing the hydrocele. In modern times, Pott preferred it to every other method, if we except injection, of which, according to Sir J. Earle, he expressed his approbation before his decease. Mr. Pott found, that the best mode of making the seton was, as follows. He employed three instruments: the first was a trocar, the cannula of which was about one-fourth of an inch broad. The second was what he called the seton-cannula, which was made of silver, was just small enough to pass with ease through the cannula of the trocar, and five inches long. The third instrument was a probe 6½ inches long, having at one end a fine steel trocar point, and, at the other, an eye, which carried the seton. The seton consisted of so much white sewing silk, as would just pass easily through the cannula, and yet fill it. The thickness of the seton, however, was not so great in the latter part of his practice. Having pierced the inferior and anterior part of the tumour with the trocar, withdrawn the perforator, and discharged the water, Mr. Pott used to pass the seton-cannula through that of the trocar, to the upper part of the tunica vaginalis, so as to be felt there. The probe, armed with the seton, was next conveyed through the latter cannula, and its point pushed through the upper part of the tunica vaginalis and scrotum. The silk was then drawn through the cannula until a sufficient quantity was brought out of the upper orifice. The two cannulæ being withdrawn, the operation was finished.

### *Injection.*

Dr. Monro attributes the first use of injections for the radical cure of hydroceles to an army-surgeon of his own name, who first used spirits of wine. This produced a cure, but, the inflammation was so violent, that he afterwards tried a milder injection, which consisted of wine. However, M. Lambert, above a century ago, in his *Œuvres Chirurgicales,* published at Marseilles, advised injecting a solution of sublimate in lime-water, and he has related cases of success. Mr. Sharp also made trial of spirit of wine, which cured the hydrocele, but, not without causing dangerous symptoms, and two subsequent abscesses in the scrotum. (*Operations of Surgery.*) Douglas, Le Dran, and Pott, all disapprove of injections, in their works; though Sir James Earle informs us, that the latter lived to alter his opinion on the subject.

The violence of the inflammatory symptoms, consequent to the first employment of injections for the radical cure of hydroceles, arose from the fluids used being too irritating. Sir James Earle, at last, preferred wine for several reasons. He found, that it had been used with success in France; its strength is never so great as to render it unsafe; and it may be readily weakened. This injection, in short, produces less pain, than any other mode of cure, does nothing more than is intended, and is as certain as any plan.

"I have commonly used (says Sir James Earle) about two-thirds of wine to one-third of water; if the parts appeared insensible, and no pain at all was produced by the first quantity thrown in, I have withdrawn the syringe, and added to the proportion of wine; on the contrary, if the complaint was recent, and the parts irritable, I have increased the proportion of water, so that I have hitherto been principally guided by the degree of sensation, which the patient has expressed. I have lately used pure water mixed with wine, and found it answer as well as when astringents were added." (P. 103. *Treatise on the Hydrocele, Edit.* 2.) In the preface, the author says, that he has long disused the pipe with a stop-cock, which he once employed, on account of not being well able to spare a hand, during the operation, to turn it, and its consequently being found awkward. A pipe, one end of which is made to fit into the cannula of of a trocar, the other adapted to receive the neck of an elastic bottle, with a valve, or ball, in the centre of the pipe to permit the entrance, and prevent the exit, of the injection, will be found infinitely more convenient and useful. (*Earle.*) When the hydrocele is very large, Sir James recommends simply letting out the fluid, and waiting, till the tumour acquires a more moderate size, before attempting the radical cure by injection.

It appears from Sir James Earle's interesting cases, that a cure may be accomplished in this manner, even when the tunica vaginalis is considerably thickened. The following is the common mode of operating; the hydrocele is to be tapped with a trocar at its anterior and inferior part, and, when the whole of the fluid is evacuated, the cavity of the tunica vaginalis is to be distended to its former dimensions with the above injection. This is to be allowed to remain in the part about five minutes, upon the average, after which it is to be discharged through the cannula. The patient usually feels some pain in the groin, and about the kidneys, on the injection being introduced: which symptoms are rather desirable, as they evince, that the stimulus of the fluid is likely to have the wished-for effect of exciting the necessary degree of inflammation. This plan, now brought to so high a pitch of perfection by Sir James Earle, may be deemed almost an infallible means of obtaining a permanent cure; and being the mildest method, also, is, of course, universally preferred.

The treatment after the operation is exactly like that of the common swelled testicle (see *Hernia Humoralis*), consisting of the use of fomentations, poultices, saline purges, and, above all, of a bag truss for keeping up the scrotum.

There is a particular case, that has been called the *congenital hydrocele*, by which is implied a collection of water in the tunica vaginalis, in consequence of there being a preternatural communication between it and the cavity of the peritonæum. Desault used to cure this disease by a red-wine injection. Any protruded viscera being returned into the belly, and the opening between that and the inside of the tunica vaginalis being carefully compressed and closed by a trusty assistant, this celebrated surgeon, after letting out the water in the common way, used to throw in the injection. The method is said to succeed, without causing the perilous consequence, one might *à priori* expect, viz. inflammation of the peritonæum. (See *Desault par Bichat.*)

This kind of hydrocele, has not been described by most writers. The case is easy of discrimination from the fluid being capable of being pushed into the belly. The French state, that this disease admits of a cure by injections, first taking care to press the upper part of the cord, so as to keep the injection from coming into contact with the peritonæum. A successful instance of this practice is related, by which a boy was cured both of a congenital hydrocele and hernia. The patient was nine years old, and had in his scrotum, ever since he was born, a fluctuating semi-transparent tumour, which was free from pain, of the size of a large egg, and disappeared, when compressed, and in a horizontal posture.—(See *Œuvres Chir. de Desault, Tom.* 2, *p.* 442.)

The success of the vinous injection in hydroceles of the tunica vaginalis, in encysted ones of the chord, and in other cases, in which Sir James Earle has tried it, particularly in a large ganglion, and a collection on the patella, makes it probable, that it will be found extensively useful in all cavities, where we wish to procure an adhesion, without destruction of parts. (*Earle, p.* 158, *edit.* 2.)

One caution it is necessary to offer, before taking our leave of this subject; it has sometimes happened, during the operation, that the cannula has slipped out of the tunica vaginalis, and its inner mouth become situated in the substance of the scrotum, in which event, the operator, if he persists in propelling in the injection, will fill the cellular texture of the part with a stimulating fluid, which may cause sloughing, and other unpleasant symptoms, without entering the cavity of the tunica vaginalis, or affording the least prospect of a radical cure of the hydrocele. When such an accident happens, it is best to defer the operation, till a sufficient quantity of fluid has collected again. Hydroceles have been cured by applying to the scrotum a solution of sal ammoniac in vinegar and water. (*Keate.*) But, the application frequently creates a good deal of pain and irritation, and does not often succeed, to say the best of it. (*Earle.*)

For information, relative to the hydrocele, the reader is particularly referred to *Monro on the Tumours of the Scrotum, in the Edinb. Med. Essays, Vol.* 5. *Pott on the Hydrocele; Else on the Hydrocele; Keate; B. Bell; Douglas; and Sir James Earle on the same.*

*Mémoire sur l'Hydrocele par Bertrandi, in Mém. de l'Acad. de Chirurgie, Tom. 3. Also the same author in Trattato delle Operazioni di Chirurgia. Nizza, 1763. Remarques, &c. sur diverses especes d'Hydrocele, en Œuvres Chirurgicales de Desault, Tom. 2. Sharp's Treatise on the Operations, and his Critical Enquiry. Also Sabatier in Médecine Opératoire, Tom. 1. Scarpa, Traité des Hernies, p. 64, &c. Larrey, in Mémoires de Chirurgie Militaire, Tom. 3, p. 409, &c. Practical Observations on the Sclerocele, &c. by T. Ramsden, surgeon to Christ's Hospital, &c.*

The mode of distinguishing a hydrocele from a scrotal hernia, as explained by Pott, is described in the article *Hernia.*

**HYDROPHOBIA.** (from ὕδωρ, water, and φοϐεω, to fear.) *A dread of water.* This being a striking symptom of that species of madness, which results from the bite of a mad dog, and some other animals affected in the same way, the disease itself has been named *Hydrophobia.* Some have used the more general term, *hygrophobia,* from ὑγρον, liquid.

Both these terms are highly objectionable, because they are derived from a symptom, which does not exclusively belong to the disease, nor constantly exist in it.

" Parmi ceux que nous avons vus mourir de la rage, quelques-uns ont eu peu d'horreur pour l'eau, pour la boisson qu'on leur présentoit." (*Lassus, Pathologie Chirurgicale, T. 2, P.* 246.)

The old writers, as we learn from Cælius Aurelianus, used the terms *aërophobia,* or *a dread of air,* and *pantophobia,* or, *a fear of all things,* as appropriate names for the disease, since the impression of cold air sometimes excited terror, and the disorder is marked by a singular degree of general timidity and distrust. Others called it *phobodipson* (διψως, signifying thirst,) because the patient is *thirsty,* yet *fears* to drink. Several modern authors, however, objecting to an appellation expressive only of one symptom, have more correctly denominated the disease *rabies,* and *rabies canina,* or canine madness. The French call it *la rage.* (*Rees's Cyclopædia, art. Hydrophobia.*) Aristotle is the first writer, that expressly mentions this disorder; but, he appears to have had a very imperfect idea of it, since he sets down man as exempt from the danger of being affected by it.

Animals of the dog kind, including the wolf and the fox, are most frequently the subjects of rabies; and certain writers have maintained, that, although it may be received and propagated by other animals, yet it always originates with some of the canine race. (*Hillary on Diseases of Barbadoes, p.* 246.) Wrong notions, of a very dangerous tendency, have been generally entertained, in regard to the disease, as it appears in the canine race. The writer of the article *Dog,* in Dr. Rees's Cyclopædia, appears to have had most extensive opportunities of observing the disorder in dogs, having paid attention to more than two hundred cases. From his remarks, I have collected the following information.

The peculiar symptom, which characterises the complaint in the human subject, has been applied to the disease in the dog, and has occasioned it to be called by the same name, hydrophobia. This is a palpable misnomer; for, in no instance, does there ever exist any dread of water; on the contrary, dogs are in general very greedy after it. Such unfounded supposition has often conduced to a very fatal error; for, it being the received opinion, that no dog is mad, who can lap water, many persons have been lulled into a dangerous security. Another equally false and fatal idea has prevailed, that every mad dog must of course be wild and furious; but, this is so far from being true, that, in the greater number of instances, there is very little of that wild savage fury, that is expected by the generality of persons. " Hence," says this author, " as it is evident, that the term hydrophobia, characterising the affection in the dog, is a misnomer, so it is evident, that the term madness is equally so. In no instance, have I ever observed a total alienation of the mind; in very few, have the mental faculties been disturbed. The disposition to do mischief is rather an increased irritability, than absence of sense; for, in most instances, even those that are furious, they acknowledge the master's voice, and are obedient." The symptom, which is most frequently first observable in a rabid dog, is a certain peculiarity in his manner; some strange departure from his usual habits. In a very great number of instances, the peculiarity consists in a disposition to pick up straws, bits of paper, rag, threads, or the smallest objects, which may happen to be on the floor. This is said to be particularly common in small dogs. " Others again shew an early peculiarity by licking the parts of another dog. In one instance, the approach of the disease was foretold, by our observing a very uncommon attachment in a pug puppy, towards a kitten which he was constantly licking; and likewise the cold nose of a healthy pug, that was with him. An attachment to the sensation of cold appears in many cases, it being very common to observe them (the dogs) licking the cold iron, cold stones, &c. Some dogs, early in the disease, will eat their own excrement, and lap their own urine." An early antipathy to strange dogs and cats is very commonly observed, but, particularly to cats. As the disease advances, the affected dogs bite those with which they are domesticated, and, lastly, the persons around; but, except in a moment of irritability they seldom attack the human subject. The irritability, that induces them to bite, is very strong; but, is devoid of wildness. It is more like peevishness, than fury. A stick held up at them always excites their anger in a violent degree, and throughout the disease, there is generally a wonderful impatience of controul, and the animals are with great difficulty frightened. (See *art. Dog in Rees's Cyclopædia.*)

For additional details, relating to the disease as it appears in the dog, I must refer to the paper, which has been just now quoted. Enough, I hope, has been said to make the reader aware, that mad dogs are not particularly characterised by an inability to lap water, or any degree of fury. These animals, when actually affected with rabies, from their quiet manner, have even not been suspected of having the disorder, and have even been allowed to run about, fondled, and even slept with. (See *Mem. of Swedish Acad.* 1777.)

The causes of this peculiar distemper in dogs are at present in much obscurity, and we have little more, than conjecture upon the subject. We do not positively know, whether rabies sometimes originates spontaneously in these animals, or, whether, like small pox, in the human species, it is propagated only by contagion. That the disease is frequently imparted in consequence of one dog biting another, every body well knows. But, still, there are many instances, in which it is certain, that no such cause can be suspected. Several facts tend to shew, that among dogs the disease is often communicated by contagion. It is observed, that, in insular situations, dogs are seldom affected, and this circumstance is ascribed to such animals being in a kind of quarantine. The celebrated sportsman, Mr. Meynell, secured his dogs from the malady, by making every new hound perform a quarantine before he was suffered to join the pack. (See *Trans. of a Society for the Improvement of Med. and Chir. Knowledge, Vol.* 1, *art.* 17.) Great heat is very commonly supposed to be an exciting cause of the disease in dogs; but, without much foundation. "A very hot climate, or one exposed to the extremes of heat and cold; a very hot and dry season; feeding upon putrid, stinking and maggotty flesh; want of water; worms in the kidnies, intestines, brain, or cavities of the nose," are set down by Boerhaave as causes of the disease.—(*Aphorism*, 1134.) We learn from Dr. J. Hunter, that in the hot island of Jamaica, where dogs are exceedingly numerous, not one was known to go mad during forty years. (*Transactions of a Society for the Improvement of Medical Knowledge, loc. cit.*)

"Although (says M. Larrey) hydrophobia is more frequent in warm, than temperate climates, it is not observed in Egypt, and the natives assured us, that they knew of no instance, in which this disease had manifested itself either in man, or animals. No doubt, this is owing to the species and character of the dogs of this country, and their manner of living.

"It is remarked, that the Egyptian dogs are almost continually in a state of inaction: during the day, they lie down in the shade, near vessels, full of fresh water, prepared by the natives. They only run about in the night time; they evince the signs and effects of their love but once a year, and only for a few instants. They are seldom seen coupled. On our arrival, there was a vast number of these animals in Egypt, because, they were held, like many others, in great veneration, and were never put to death. They do not go into the houses: in the day time, they remain at the sides of the streets, and they only wander into the country at night, in order to find any dead animals, which happen to be unburied. Their disposition is meek and peaceable, and they rarely fight with each other. Possibly, all these causes may exempt them from rabies." (*Larrey, in Mém. de Chir. Militaire, Tom.* 2, *p.* 226.)

In Mr. Meynell's account, which was communicated to him by a physician, it is asserted, that the complaint never arises from hot weather, nor putrid provisions, nor from any cause except the bite; for, however dogs have been confined, however fed, or, whatever may have been the heat of the season, the disorder never commenced, without a possibility of tracing it to the preceding cause, nor was it ever introduced into the kennel, except by the bite of a mad dog. This malady is also stated to be rare in the northern parts of Turkey, more rare in the southern provinces of that empire, and totally unknown under the burning sky of Egypt. At Aleppo, where these animals perish in great numbers, for want of food and water, and the heat of the climate, this disorder was never known. In other parts of Africa, and in the hottest zone of America, dogs are said to be never attacked with madness. (See *art. Dog, in Rees's Cyclopædia.*)

Dr. Gillman endeavours to prove, that the disease in dogs is probably produced independently of particular climates, of putrid aliment, of deficiency of water, of want of perspiration, or, of the worm under the tongue, to which it has been at different times ascribed, and he expresses his belief, that it originates somewhat like typhus in the human subject, and is not always produced by inoculation by means of a bite. He thinks, that it may be occasionally brought on by the confinement of dogs, without exercise, in close and filthy kennels; and that the success of Mr. Trevalyan, as related by Dr. Bardsley, in clearing his kennel of the disease, by changing even the pavement, after other means of purification had failed, affords presumptive evidence in favour of the opinion; and, consequently, this author thinks, that the method of quarantine, adopted by Mr. Meynell, and recommended by Dr. Bardsley, on the supposition, that the disease originates exclusively from contagion, will not be a sufficient preventive alone; and he shews, from some facts, reported by Mr. Daniel, that the poison sometimes lies dormant in dogs four, five, and six months; and, consequently, he infers, that the period of two months is not a sufficient quarantine, before a new dog is introduced into a pack. (See *Gillman's Diss. on the Bite of a Rabid Animal.*)

It is observed by the late Dr. J. Hunter, that all domestic animals, birds, as well as beasts, are susceptible of the poison of the mad dog; and, indeed, our experience has not yet taught us that there is any race of animals exempted from its effects. Whether every animal labouring under the disease is capable of infecting others, or whether this power is confined to a few only, we are yet to learn.

The disease has been communicated to the human species by dogs, cats, wolves, and foxes. The dog, the wolf, and the jackal, have, by the late inquiries of naturalists, (*Mr. Hunter's paper, Phil. Trans. Vol.* 77, *p.* 253.) been ascertained to be of the same species; and therefore it is probable, from analogy, that the latter is capable of communicating the infection as well as the two former. The fox also has a strong affinity to the dog, and is by Linnæus counted of the same *genus*; but the distinctions of natural history will not avail us here; for the cat, an animal of a very different *genus*, has often produced the hydrophobia, in the human species. Many other animals are reported to have the power of infecting others, by biting them while labouring under the disease themselves; but the facts hitherto collected are very vague, and lead to nothing conclusive on this head. Were we to judge from analogy, from seeing two animals so different from each other as the dog and the cat, capable of infecting others, we might be led to infer, that every animal susceptible of the disease had the power of communicating it, provided their natural habits led them to bite and tear with their teeth such animals as came in their way while in an enraged state. But, though there are instances of men labouring under hydrophobia biting some of those employed in taking care of them, no ill consequences have been known to follow. From this, however, we can draw no positive inference, for it is but a small proportion of such persons as are bit by dogs undoubtedly mad, who are infected with the poison.

The bite only serving the purpose of inoculation, the danger arising from it will be various, as it happens to be in a part more or less vascular; or as the teeth are more or less loaded with the poison. There is the greatest danger from bites in the face, and the symptoms come on soonest; bites in the hands also, which are generally bare, are full of danger. In other parts of the human body the clothing, by wiping the teeth, greatly lessens the danger of infection. The bite is not essentially necessary for the application of the poison: a dog, by licking a sore, produced the hydrophobia; but he licked it till it bled, so that the poison came into contact with the newly divided blood-vessels. This circumstance, if we may judge from the analogy of other poisons, is probably of importance in giving efficacy to the poison, yet it is not clear that it is essential; for there are two cases of the disease mentioned in the Philosophical Transactions, (*Phil. Trans. Vol.* 23, *p.* 1074.) which arose from putting the hands in the mouth of a puppy that was mad, but when there was no bite; and there is a similar case in the Memoirs of the Royal Academy of Sciences of Sweden. (*Anno*, 1777.) It is true, various other modes of infection are narrated by writers, but in all of them there is much appearance of fabulous credulity. There is good reason to think that tetanus has sometimes been mistaken for hydrophobia, and given rise to the accounts of the diseases proceeding from the bite of a cock, the claw of a cat, and similar histories.

Dogs are much more susceptible of the infection than the human species. Four men and twelve dogs were bit by the same mad dog, and every one of the dogs died of the disease, while all the four men escaped, though they used no other means of prevention but such as we see every day fail. There is also an instance of twenty persons being bit by the same mad dog, of whom only one had the disease.

There is a question which naturally presents itself here; does the disease ever arise spontaneously in the human species? The facts relating to this question involve many doubts. Francis Stannier died in November 1787, with the symptoms of hydrophobia, though it was not known that he had ever been bitten by a mad dog; (*London Med. Journal, Vol.* 9, *p.* 256.) and similar cases are related by writers. (See *Mémoires de la Societé Royal de Médecine pour l'année* 1783, *seconde partie.*) Yet as a large bite is no way necessary to communicate the infection, the patient above-mentioned may have been slightly bit, without knowing it, as he was often drunk, and frequently in the streets at night. There is good reason to believe that the difficulty of swallowing, which sometimes occurs in tetanus, has occasionally been mistaken for hydrophobia; and there may be other spasms about the throat and the œsophagus, which may so far resemble hydrophobia, as to give rise to errors on this subject. Something of this kind occurred once to Dr. John Hunter, in an hysteric woman. Were we to be guided by analogy in deciding the present question, we should be led to deny the existence of spontaneous hydrophobia; for, where is there an example of any of those diseases which depend upon a specific poison, as the small-pox, the venereal disease, or the measles, arising spontaneously? But the full decision of this question must be left to future experience and observation. (*Dr. J. Hunter in Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol.* 1, *p.* 299—303.)

Dr. Heysham has defined hydrophobia to be an aversion and horror at liquids, exciting a painful convulsion of the pharynx, and occurring at an indeterminate period after the canine virus has been received into the system. Dr. Cullen places it in the class *neuroses*, and order *spasmi*, and defines it a loathing and great dread of drinking any liquids, from their creating a painful convulsion of the pharynx, occasioned most commonly by the bite of a mad animal. Others have suggested the following definition, as more complete: melancholy, dread of cold air, of any thing shining, and particularly of water; often arising from the bite of a mad animal. (*Parr's Med. Dict.*) However, the latter definition is, perhaps, equally objectionable, because there is not invariably a dread of shining bodies. (See *Dr Powell's Case, p.* 8.)

Writers in general have divided hydrophobia into two stages, viz. the *melancholy*, and the *raving*; the *hydrophobia simplex*, and *rabiosa*, of Cullen. In many instances, however, the latter stages of the disorder are not preceded by any condition, to which the epithet melancholy is applicable.

With regard to the symptoms of hydrophobia, they are generally tardy in making their appearance, a considerable, but a very variable space of time usually elapsing between their commencement and the receipt of the bite. This interval in the greater number of instances appears to be about six weeks. Out of a table of 131 cases, none of the patients became ill before the eleventh day after the bite, and only three before the eighteenth. Dr. Hamilton thinks nineteen months the longest interval, to which any credit can be given. (*On Hydrophobia, Vol.* 1, *p.* 113.) On the other hand, Dr. Bardsley, of Manchester, has recorded a case, in which the most careful enquiries tended to prove, that the patient had never suffered the least injury from any animal, except the bite, inflicted twelve years previously to the commencement of the hydrophobia, by a dog apparently mad. (*Mem. of Liter. and Phil. Society of Manchester, Vol.* 4, *Part* 2, *p.* 431.) The wound, if treated by common methods, usually heals up at first in a favourable manner. At some indefinite period, and occasionally, long after the bitten part seems quite well, a slight pain begins to be felt in it, now and then attended with itching, but generally resembling a rheumatic pain. It soon extends from the wound up the arm, and affects the situation of the trapezius muscle, and the neck, on the same side as the bite. The cicatrix, in the mean while, begins to swell, inflames, and, at length, discharges an ichorous matter. There are often pains of a more flying, convulsive kind, felt in various parts of the body. As the disease advances, the patient complains of the pain shooting, from the situation of the bite, towards the region of the heart. Dr. Marcet particularly observed, that the pain follows the course of the nerves, rather than that of the absorbents. In the case which he has related, as well as in one of the cases detailed by Dr. Babington, there was pain in the arm and shoulder, but without any affection of the axillary glands; and in another case, published in the second volume of the Medical Communications, the pain occasioned by a bite in the leg was referred to the hip and loins, without any affection of the inguinal absorbents. (*Medico-Chir. Trans. Vol.* 1, *p.* 156.) Of the accuracy of the foregoing statement, by Dr. Marcet, there is no doubt: the observation, however, in regard to the irritation not affecting the absorbents, was long ago anticipated by a foreign writer, whose valuable work is too little consulted in England: "Resorptionem virus ope systematis lymphatici fieri verisimillimum videtur; neque tamen nec vasa lymphatica, nec glandulæ vicinæ stimulo morboso, vel tumore adfici videntur; quod in aliis resorptionibus virulentis fieri solet." (*Callisen Syst. Chirurgiæ Hodiernæ, Vol.* 1, *p.* 595, *Hafniæ,* 1798.) A lassitude, a dull pain in the head, and a vertigo, soon come on: the patient is commonly melancholy, though not always, mutters, is forgetful, and drowsy; his mind seems disordered; his temper irritable and irregular; his slumbers disturbed, and convulsive agitations immediately follow his waking; a deafness is sometimes complained of; the eyes are watery; the aspect sorrowful; the face pale and contracted; sweat breaks out upon the temples; and an unusual discharge of saliva is made from the mouth. From the beginning, a peculiar stricture and heaviness on the breast, occasional involuntary sighs, and nausea, take place. There is often a bilious vomiting. The idea of drinking any kind of fluids creates considerable alarm and agitation, and the attempt to do so generally brings on most afflicting pains and convulsions, attended with a dreadful sense of suffocation, and choaking. Dr. Marcet, in relating the case of a patient affected with hydrophobia, observes, that "on our proposing to him to drink, he started up, and recovered his breath by a deep convulsive inspiration; yet, he expressed much regret, that he could not drink, as he conceived, it would give him great relief, his mouth being extremely parched and clammy. On being urged to try, however, he took up a cup of water in one hand, and a tea-spoon in the other. The thought of drinking out of the cup appeared to him intolerable; but, he seemed determined to drink with the spoon. With an expression of terror, yet, with great resolution, he filled the spoon, and proceeded to carry it to his lips; but, before it reached his mouth, his courage forsook him, and he was forced to desist. He repeatedly renewed the attempt; but, with no more success. His arm became rigid and immoveable, whenever he tried to raise it towards his mouth, and he struggled in vain against this spasmodic resistance. At last, shutting his eyes, and, with a kind of convulsive effort, he suddenly threw into his mouth a few drops of the fluid, which he actually swallowed. But, at the same instant, he jumped up from his chair, and flew to the end of the room panting for breath, and in a state of indescribable terror." (See *Medico-Chirurgical Transactions*, *Vol.* 1, *p.* 138.) Even the splashing, or running, of any liquid causes a great deal of inconvenience. As the system becomes more and more affected, the patient loses his sleep entirely, and has frequent and violent fits of anxiety and loud screaming from slight causes. The woman, whom Dr. Powell attended, was often attacked in this way, in consequence of so trivial a circumstance as a fly settling on her face. The noise of tea-cups, or the mention of any sort of drink, greatly disturbed her, though she was not at all agitated by the sound of herurine. The currents of air entering her room, whenever the door opened, became very distressing to her, and this more and more so. The pain in her neck became so great, that she could scarcely bear it to be touched; but she made use of a looking-glass without the inconvenience which hydrophobic patients usually suffer from the sight of shining bodies. Dr. Powell states, that the paroxysms which this poor woman suffered, resembled those of hysteria, and increased in duration as the disorder lasted. "She described their commencement to be in the stomach, with a working and fulness there, and that a pricking substance passed up into her throat and choaked her; she screamed suddenly, and grasped firmly hold of her attendants, as if voluntarily; and muscular convulsions came on, which were sometimes more, sometimes less general and violent. The causes from which these paroxysms arose, were extremely slight; the passage of a fly near her face, the attempt to swallow a pill, a stream of air, the sight of oil or wine, or any other liquids, even the sound of water, and other such circumstances, were sufficient; she now also complained of inconvenience from light, which was accordingly moderated. The effect of sounds was peculiar; for, though in the subsequent stages, their influence became more general, at this period the effect was rather proportionate to the ideas they excited in her mind, than to their violence. Bells, and other strong noises, did not agitate her, but the clatter of earthen ware, the noise of a distant pump, or any thing connected with liquids, produced the paroxysms in all their violence." She could swallow fresh currants with less resistance then any thing else, taking care that they were perfectly dry. Her mind had, till now, been quite calm and composed, and her conversation and behaviour proper, during the intervals of the convulsive attacks. But Dr. Powell was obliged to discontinue the pills of argentum nitratum, in consequence of the sufferings which the attempt to swallow them regularly brought on. Fifteen grains of this substance had been given without any sensible effect. The fits, and the irritability to external objects, increased. The pain shot from the back of the neck, round to the angles of the jaws, the chin, and throat. At length, the paroxysms became more frequent, and, indeed, might be said to come on spontaneously: seven occurred in one hour. She looked pale and exhausted, and a tremor and blueness of her lips and fingers were observable; her pulse became weaker and more rapid, and her scalp so tender, that touching it brought on convulsions. She had, latterly, eructations of wind, and spit up some thick viscid saliva. Her urine now came away involuntarily, and she was more and more irritable and uncontrollable. Indeed, she passed two hours in almost constant convulsions; became extremely irritable and impatient of every thing about her, complained of failure of her sight; wished to be bled to death; her words were fewer and interrupted; she struck, and threatened to bite, her attendants; had copious eructations of air; discharged an increased quantity of viscid saliva with much convulsive effort; said the affection of her throat and stomach had quite left her; and continued in a general perspiration, with a weak pulse from 140 to 150. She afterwards bit some of the attendants, and was therefore confined with a waistcoat. From this period, she had lost all control over her mind, and continued for almost four hours in a paroxysm of furious insanity. She now swallowed, with an effort, near half a pint of water: but this was, in a few seconds, vomited up, with some mucus, and a greenish fluid. In this violent raving state, she continued till within two hours of her death, which took place forty-seven hours after the first marked occurrence of hydrophobia. In the course of the case, she swallowed once, or twice, a little porter; and also some cinnamon-water, with tinct. opii; but they were always vomited up. On opening the body, the most remarkable appearances were, a turgid state of the vessels of the brain; great distention of the intestines with air; the œsophagus rather redder than natural, and covered with a thin layer of coagulating lymph; nearly half a pint of greenish fluid in the stomach, which was rather redder than natural, and had under its internal coat, near the cardia, a few spots of extravasated blood. (*Dr. Powell's Case of Hydrophobia.*)

The dread of swallowing liquids, though the most singular symptom of the disease, constitutes but a small part of the malady. It is true, that none, or very few recover, who have this symptom, yet, they certainly do not die, in consequence of the difficulty of swallowing liquids; for, the human body could easily exist double the time, in which the disease usually proves fatal, without food, or drink. Besides, the sick can often swallow substances, that are nourishing, in a pulpy state, without, however, having their life thereby at all prolonged. It is not, therefore, the difficulty, or impossibility of swallowing liquids; but the effects of the poison upon the constitution at large, which occasion death. (*Dr. J. Hunter, in Trans. of a Society for the Improvement of Med. Knowledge, Vol.* 1, *p.* 305.)

The extreme sensibility of the sick to all impressions, appears in the displeasure which they express at even the air blowing upon them; in their dislike to a strong light; in their aversion to new faces, or even the sight of their friends and relations; and in the terror they express at being touched, which almost threatens to throw them into convulsions. As the disease advances, the mind is more and more filled with dreadful fears and apprehensions. (*Op. cit. p.* 307.)

The duration of life, from the appearance of the hydrophobia till death, varies from thirty-six hours to four or five days: the most common period is from two to three days. (*Op. cit. p.* 308.)

The dread of water is said to be sometimes a symptom of certain fevers, from topical inflammations of the thorax, or neighbouring parts. (*Edinburgh Medical Commentaries, Vol.* 2, *p.* 331.) A species of hydrophobia has been known to originate from an inflammation of the stomach. (*Med. Essays, Vol.* 1.) Also from the bite of an epileptic patient, or of persons in violent fits of passion; and from the accession of epilepsy. An inferior degree of it is said to be observable in some hysteric cases, when, from the difficulty of swallowing, patients are fearful of taking liquids. In the latter cases, musk and opium are recommended.

In considering the treatment of hydrophobia, we should always recollect two important facts; viz. the disease may often be prevented; it can hardly ever be cured. Experience has fully proved, that when hydrophobia once begins, it generally pursues its dreadful course to a fatal termination, the records of medicine furnishing very few unequivocal and well authenticated cases to the contrary. Hence, the imperious necessity of using every possible means for the prevention of the disorder.

Many things, however, which possess the character of being preventive of hydrophobia, probably have no real claim to such reputation. I would extend this observation to all internal medicines, mercurial frictions, and plunging the patient for a considerable time under water.

The instances, in which a prevention is inferred to have taken place by different writers, in consequence of such means, may all be very rationally ascribed to other circumstances. It is well known, that, out of the great number of persons, frequently bitten by the same dog, only a few are commonly affected. (See *Fothergill in Med. Obs. and Enq. Vol.* 5, *p.* 195.) The hydrophobic poison is known to reside in the saliva of the animal; consequently, the chance of being affected must greatly depend upon the quantity of this fluid which may be insinuated into the wound; and, if the teeth of the animal should have previously pierced a thick boot, or other clothing, before entering the skin, the danger must obviously be in general much diminished. Many patients wash and suck the wound, immediately after its occurrence, and thus, no doubt, very often get rid of the poison. Even when it has lodged in the wound, it may not be directly absorbed, but be thrown off with the discharge. All prudent patients submit to excision of the bitten part. Now, under each of the above circumstances, escapes have frequently occurred, while internal medicines, half drowning, or salivating the patients, had also not been neglected, so that all the efficacy of preventives has too often been most unjustly ascribed to means, which probably never yet had, nor ever will have, any beneficial effect whatever. What confirms the truth of the preceding statement are these facts; that persons bitten by the same animal have sometimes been treated exactly on the same plan; some of them have escaped having the disease; others have had it, and, of course, perished: on other occasions, some of the patients, bitten by the same animal, have been treated in a particular way, and have escaped hydrophobia; while others bitten at the same time by the animal, also never had any constitutional effects, although they took no medicines, nor followed any other particular plan.

Happily, there is, in surgery, one tolerably certain means of preventing hydrophobia, when it is practised in time, and in a complete manner. Every reader will know, that the excision of the bitten parts is the operation to which I allude. Indeed, as hydrophobia is often several months before it begins, the wounded parts should, perhaps, always be cut out, even though they are healed, and some weeks have elapsed since the accident, provided no symptoms of hydrophobia have actually commenced. The operation should be done completely; for a timorous surgeon, afraid of cutting deeply enough, or of removing a sufficient quantity of the surrounding flesh, would be a most dangerous one for the patient. All hopes of life depend on the prevention of the disorder; for, in the present state of medical knowledge, none can rest upon the efficacy of any plan, except the extirpation of the part. This some have done with caustics. However, as their action can never be regulated with the same precision as that of the knife, and, consequently, they will not always destroy the flesh to a sufficient depth, excision should always be preferred. The latter method is also the safest, for another important reason, viz. the part, and poison lodged in it, are removed from the body at once; but, when caustic is used, the slough will not be thrown off for some days afterwards.

Some surgeons of the present day are not content with cutting out the part; they recommend, after the operation, filling the wound with the aqua ammoniæ puræ, so as to produce a general sloughing of its surface, by way of greater security.

I have already mentioned the important but melancholy truth, that when once the hydrophobic symptoms have commenced, there is little or no hope of saving the patient, the disease having almost invariably baffled every plan of treatment, which the united talents of numerous medical generations have suggested. All the most powerful medicines of every class have been tried again and again; mercury; opium; musk; camphor; arsenic; the nitrate of silver; cantharides; belladonna; the volatile alkali; plunging the patient into the sea; bleeding; &c. &c. Some facts, however, which have lately occurred in the East Indies, seem to me to demand serious attention. Mr. Tymon, assistant surgeon of the 22d Light Dragoons, tried successfully the method of taking away at once an immense quantity of blood from the patient, "I began by bleeding him (says Mr. Tymon) *until scarcely a pulsation could be felt in either arm.*" Opium was afterwards given, and the patient salivated with mercury. (See *Madras Gazette of Nov.* 23, 1811.)

Although in the observations, annexed to this case by Dr. Berry, there are some circumstances, which render it probable, that the case was really hydrophobia; yet, as the successful termination of it is an event so extraordinary, I much regret, that some desirable information is omitted. For instance, we have no account of any pain, or changes, in the bitten part, or limb, at the first coming on of the indisposition. The early constitutional symptoms are not described, and the violent spasms, screaming, &c. are the first things mentioned. Some particulars of the dog would also have been interesting.

Such information, indeed, becomes still more essential, when we find it stated, that another man, Serjeant Jackson, was also bitten by the same dog, and had hydrophobia *in a mild form,* from which he recovered under the use of mercury, blisters to the head, and cathartic injections, without any recourse to bleeding at all. This last case is even more contrary than the former, to what general experience teaches; because mercury, blisters, and injections, have been tried a thousand times unavailingly; while, perhaps, bloodletting, *in the manner practised by Mr. Tymon,* is a new treatment. Dr. Schoolbred, of Calcutta, has published a second case of hydrophobia cured by bleeding ad deliquium animi, and afterwards exhibiting calomel and opium. This patient required a second large bleeding in consequence of being threatened with a relapse. The whole of the success is imputed by Dr. Schoolbred to the venesection. But, this gentleman is not so sanguine as to believe, that bleeding will cure every case of hydrophobia. It is probable, that there is a period, beyond which its curative effect cannot extend, and, therefore, it is upon the very first appearance of unequivocal symptoms of the disease, that, he thinks copious bleeding affords a prospect of success, while the delay of only a few hours may prove fatal. He observes, that the medical profession, taught by numerous disappointments, admit very cautiously the claims of any new practice to general adoption. If several patients, in hydrophobia, therefore, should happen to be bled in an advanced stage of the disease, and die, (as they inevitably would do, whether they had been bled or not) such cases would be quoted against the new practice, as failures. But, Dr. Schoolbred rightly contends, that numerous failures in an advanced stage of the disease can form no just ground for the rejection of a remedy, which has incontestably effected a cure in an earlier stage of the disorder. He insists upon the necessity of making a large orifice in the vein, so as to evacuate the blood quickly, which must be allowed to flow, without regard to quantity, ad deliquium animi.

Dr. Schoolbred was well aware, that bleeding in cases of hydrophobia had often been tried. But, says he, owing probably to the evacuation not having been pushed far enough, when used in the early stage of the disease; or to the period for its beneficial employment having elapsed; the cases, in which it was tried, afforded little, or no encouragement to the continuance of the practice.

Dr. Mead, who was very confident, that he had found an infallible preventive of the disease *in a little liverwort and black pepper*, aided by bleeding and cold bathing before the commencement of the course of medicine, says, "as to all other ways of curing the hydrophobia, I own I have not been so happy as to find any success from the many I have tried. Bathing at this time is ineffectual. *I have taken many large quantities of blood;* have given opiates, volatile salts, &c. All has been in vain, *because too late.*" Notwithstanding his disappointment, he concludes; "If any relief could be expected in this desperate state, I think it would be *from large bleeding, even ad animi deliquium,*" *&c.*

The doctrines of Boerhaave also led him and his pupils to recommend and practise bleeding in hydrophobia. "The distemper (says he) is to be treated as one highly inflammatory, upon the first appearance of the signs which denote its invasion, by *bloodletting from a large orifice, continued till the patient faints away;* and soon after by enemata of warm water and vinegar, &c." and he adds, "that this practice is supported by some small number of trials." But, the particulars of this successful practice are not given.

Dr. Schoolbred finds, however, that a trial of it was made at Edinburgh, more than sixty years ago, by Dr. Rutherford, who took away gradually sixty six ounces of blood from a patient, who had already been bled the same morning. As the patient lived 48 hours after the large bleeding, the method was probably tried somewhat early in the disease; and the case may therefore be set down as a fair instance of a failure of the practice. But, as early and large bleeding is not cried up, by its strongest advocate Dr. Schoolbred, as a means, which will invariably answer, but as a plan, which promises to be more successful, than any other one known, the occurrence of a single failure is no reason for a general condemnation of the practice.

Bleeding is said to have also been recommended, in cases of hydrophobia, by Poupart. (See *Hist. de l'Acad. Royale des Sciences, pour l'année,* 1699.) The practice is likewise mentioned in the *Medical Essays of Edinburgh, Vol.* 5, *part* 2. § 5; and in the writings of Dr. Rush.

I shall conclude this article with referring the reader to the following works, for farther information on hydrophobia: *Sauvages sur la Rage; James on Canine Madness; Mead, on the Bite of a Mad-dog; Seleg, Nugent, and Hamilton, on Hydrophobia; Medical Museum, Vol.* 2; *London Medical Transactions, Vol.* 2; *Med. Obs. and Inq. Vol.* 3; *and Fothergill in Vol.* 5 *of the same work. Dissertation sur la Rage, par M. Le Roux, Paris,* 1783, *in* 4*to. Edinb. Med. Comment. Vol.* 5, *p.* 42; *Vaughan's Two Cases of Hydrophobia; Dr. Powell's Case of Hydrophobia; Latta's System of Surgery, Vol.* 3; *Cullen's First Lines, Vol.* 4; *Memoirs of the Med. Society of London, Vol.* 1, *p.* 243; *Medical Communications, Vol.* 1; *Mem. of the Royal Society of Medicine in Paris, Supplement to Vol.* 4. *Ferriar's Med. Facts and Observations. Richerand's Nosographie Chirurgicale, Tom.* 1, *p.* 251, *&c. Edit.* 2. *Callisen's Systema Chirurgiæ Hodiernæ, T.* 1, *p.* 593, *Hafniæ,* 1798. *Marcet, in Medico-Chirurgical Transactions, Vol.* 1, *p.* 132, *&c. Lassus, Pathologie Chirurgicale, Tom.* 2, *p.* 239, *&c. Edit.* 1809. *A valuable paper by Dr. John Hunter in Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol.* 1, *Art.* 17. *Gillman's Dissertation on the Bite of a Rabid Animal. Levéillé, Nouvelle Doctrine Chirurgicale, Tom.* 2. *p.* 341, *&c. Bardsley in Memoirs of the Literary and Philosophical Society of Manchester, Vol.* 4, *Part* 2. *Babington, in the Medical Records and Researches, Lond.* 1798. *Art. Hydrophobia in Rees's Cyclopædia. Richter's Anfangsgrunde der Wundarzneykunst, B.* 1, *p.* 252, *&c. Gottingen* 1799. *Dr. Berry's Obs. and Mr. Tymon's case cured by large bloodletting, as detailed in the Madras Gazette of November* 23, 1811. *And Dr. Schoolbred's Case successfully treated by copious bleeding, as related in one of the Asiatic Mirrors for May* 1812. *Also O'Donnel's Cases of Hydrophobia* 1813. *Boyer's Traité des Maladies Chirurgicales, Tom.* 1, *p.* 435, *&c. Paris* 1814.

**HYDROPHTHALMIA.** (from ὑδωρ, water; and οφθαλμος, the eye.) *Dropsy of the eye.* In all the cavities of the animal body (says Scarpa) which are continually moistened by a serous vapour, as well as in those destined to contain a determinate quantity of an aqueous, limpid fluid, there is such a reciprocalness of action, between the secerning extremities of the arteries, and the minute mouths of the absorbent vessels, that the fluid effused in these cavities is always in circulation, being incessantly renovated, but never accumulating beyond a certain degree and determinate measure. When this mutual action, existing between these two vascular systems, is interrupted, in consequence of a general or local indisposition, the above cavities, being no longer moistened by a serous vapour, shrivel and become obliterated; or, on the contrary, being unusually distended by the excessive quantity of fluid, they acquire an enormous magnitude, much beyond what a person, unacquainted with these things, would suppose.

As Scarpa continues, the eye, considered simply as a cavity destined to contain a certain quantity of limpid fluid, is occasionally subject to both these infirmities. The first is termed *atrophy;* the second, *dropsy of the eye*, or *hydrophthalmia.* In the first case, the globe of the eye gradually becomes smaller; and, as the absorbent system does not cease acting, when there is no more fluid to be absorbed, it gradually consumes the solid parts of this organ, which it insensibly diminishes, and in time destroys. In the second case, the eye assumes a greater bulk than is natural to it; sometimes acquiring such an extraordinary magnitude, that it projects out of the eyelids, at first with great weakness, and afterwards with total loss of sight.

Surgeons generally state, that the immediate cause of the dropsy of the eye, is sometimes an increase of the vitreous humour, sometimes of the aqueous. In every case of this kind, on which Scarpa has performed the operation, and in other examinations of the different stages of the disease, made on the dead subject, he has constantly found the vitreous humour, more or less, altered in its organization, liquified, and converted into water, according as the disease was ancient, or recent. In some instances, he could not distinguish whether the increased quantity of the vitreous or the aqueous humour had most share in the formation of the disease. Some of the most celebrated modern oculists believe, that the principal cause of this complaint is referrible to the closure of the inorganic pores of the cornea, through which the aqueous humour can no longer transude, and consequently collects in the interior of the eye, so as to occasion dropsy. By this assertion, they evince, that they are not sufficiently acquainted with the activity of the absorbent system in the animal economy; and they do not seem to have adverted that, in conformity with their theory, the dropsy of the eye ought invariably to follow a thickening of the conjunctiva spread over the organ, as well as the leucoma and extensive scars of the whole cornea; a thing that is contradicted by daily observation and experience.

Scarpa has also dissected a dropsical eye, taken from the body of a child, three years and a half old, who died of marasmus. The vitreous humour was not only wanting in this eye, and the cavity destined for its reception filled with water, but the vitreous tunic was converted into a substance, partly of a spongy, partly of a lippomatous nature. This dropsical eye was one-third larger than the sound one. The sclerotica was not thinner than that of the other eye; but, in consequence of being yielding, flaccid, and separated from the choroides, it had lost its plumpness, and globular shape. The cornea formed a disk, one-third larger than that of this membrane in a sound state; it did not retain its natural pulpousness, and was obviously thinner than the cornea of the healthy eye. There was a considerable quantity of an aqueous, reddish fluid, between the cornea and iris. The crystalline lens, with its opaque capsule, had been pushed forward a little way into the anterior chamber, but could not advance further, on account of a firm adhesion, which the capsula had contracted with the iris, around the edge of the pupil. As soon as the capsule was opened, the lens issued from it, half dissolved, the rest exceedingly soft. It was impossible to detach the whole of the posterior layer of the capsule from a hard substance, which seemed to be the altered membrane of the vitreous humour. Scarpa, therefore, slit open the choroides, from the ciliary ligament to the bottom of the eye, when a considerable quantity of a reddish aqueous fluid gushed out, without, however, one particle of the vitreous humour. In lieu of the latter body, there was found a small cylinder of a substance, partly of a fungous, partly of a lippomatous nature, surrounded with a good deal of water, which was effused in the longitudinal axis of the eye, from the entrance of the optic nerve, as far as the ciliary ligament, or that hard substance to which the posterior layer of the capsule firmly adhered. This little cylinder was covered, for the extent of two lines and a half forwards from the entrance of the optic nerve, by a stratum of whitish matter, reflected on itself, like the epiploon, when raised towards the fundus of the stomach. Scarpa conceived that this stratum of whitish matter was nothing else than the relics of the unorganized retina; for, on pouring rectified spirits of wine on the whole inner surface of the choroides, and the little cylindrical body, he found no vestiges of the retina on this membrane, and that the whitish substance, which was reflected on itself, became very firm, just as the retina does when immersed in spirit of wine. Both the cylinder and the indurated substance, occupying the place of the ciliary body, were manifestly nothing else than the membrane of the vitreous humour, destitute of water, and converted, as was described, into a substance, partly of a spongy, partly of a lippomatous nature. It is not easy to determine whether this fungous and lippomatous degeneration of the vitreous tunic had preceded, or was a consequence of the dropsy of the eye. However it may be, this fact, in conjunction with several other similar ones, that Scarpa has met with, in which he found no vitreous humour in the posteriour cavity of the eye, but only water, or a bloody lymph, tends very much to confirm that this disease principally consists of a morbific secretion of the vitreous humour, and occasionally, also, of a strange degeneration of the alveolary membrane, by which this humour is formed. Scarpa refers to a similar case in *Medical Obs. and Inquiries, Vol.* 3, *Art.* 14.

The augmentation in the secretion of the aqueous fluid, both in the cells of the vitreous humour and out of them, after they have been ruptured from excessive distention; together with a debilitated action of the absorbent system of the eye affected; are, most probably, continues Scarpa, the causes of every species of dropsy, and, consequently, of the morbific accumulation of humours in the eye. From such a lodgment, and successive increases, of the vitreous and aqueous humours, the eye-ball at first necessarily assumes an oval shape, ending at the point of the cornea; then, as the organ enlarges in all dimensions, it acquires a larger size than that of its fellow; so that, in the end, it projects from the orbit in such a manner, that it cannot be covered by the eyelids, and disfigures the patient's face as much as if an ox's eye were placed in the orbit, instead of his own natural one.

This disease (says Scarpa) is sometimes preceded by blows on the eye, or adjoining temple; sometimes by an obstinate internal ophthalmy. In other instances, it is preceded by no other inconvenience except an uneasy sensation of tumefaction and distention in the orbit, a difficulty of moving the eye-ball, and a considerable impairment of sight. Lastly, it is sometimes preceded by none of these causes, or no other obvious one whatever, especially when the complaint occurs in children of very tender age, from whom no information can be obtained. As soon as the eye has assumed an oval form, and the anteriour chamber has become preternaturally capacious, the iris seems situated further backward than usual, and tremulates, in a very singular way, on the slightest motion of the eye-ball. The pupil remains dilated in every degree of light, while the crystalline is sometimes brownish from the very beginning of the disease; and sometimes it does not become cloudy till the affection has arrived at its highest pitch. The complaint then becomes stationary; and, as the crystalline is not deeply opaque, the patient can distinguish light from darkness, and, in some degree, the contour of objects, and brilliant colours. But, when the eye has acquired a larger volume, and the whole crystalline has become opaque, the retina at last remains in a state of paralysis, from the excessive distention, and, consequently, is no longer sensible to such few rays of light as reach the bottom of the eye, by insinuating themselves at the sides of the lens.

In the last stage of the disease, (continues the above celebrated surgeon) when the dropsical eye projects from the orbit, so as not to admit of being covered by the eyelids, with the inconveniences already enumerated, others associate themselves, arising from the friction of the ciliæ, the secretion of gum, the flux of tears, the ulceration of the lower eyelid, on which the eye rests, and the excoriation of the eye itself. Hence, the dropsical eye is gradually attacked by violent ophthalmies, attended with intolerable pains of the part affected, and of the whole head. The ulceration, also, does not always confine itself within certain limits; but continues to spread, first depriving the cornea of its transparency, next consuming the sclerotica, and lastly, destroying progressively the other component parts of the eye-ball.

At the first appearance of the dropsy of the eye, the masters of the art recommend the internal administration of mercurials, the extract of cicuta, and of pulsatilla nigricans; and the external employment of astringent and corroborant collyria, making a seton in the nape of the neck, and compressing the eye, which forms a preternatural projection out of the orbit. As far, however, as Scarpa can judge, from the events of observations made by the best practitioners on this point, he has never yet met with a single well-detailed history of a dropsy of the eye cured by means of the above-mentioned internal medicines. With regard to externals, he has learnt, from his own experience, that, when the disorder is manifest, astringent, and corroborant collyria, as well as compression on the protuberant eye, are highly prejudicial. In such circumstances, making a seton in the nape of the neck, frequently bathing the eye in a lotion of mallows, and applying to it a plaster composed of the same plant, have enabled him to calm, for a time, that disagreeable sense of distention in the orbit, and over the forehead, and temple of the same side, of which patients in this state make so much complaint, especially when they are affected with a recurrence of ophthalmy. But, as soon as the eye-ball begins to protrude from the orbit, and project beyond the eyelids, there is no means of opposing the very grievous dangers, which the dropsy of the eye threatens, except an operation, which consists in evacuating, by an incision, the superabundant humours from the eye, then exciting gentle inflammation of the membranes, and suppuration in the interiour of this organ, so as to make it contract, and shrink into the bottom of the orbit. To defer the operation any longer, would be abandoning the patient to the constant inconvenience of an habitual ophthalmy, the danger of an ulceration of the eye-ball and subjacent eyelid, and, what is worse, of carcinoma of the whole eye, with great peril to the patient.

Scarpa next states, that, in order to fulfil the preceding indication, of evacuating the superabundance of aqueous humours lodged in the eye, the paracentesis of the eye-ball has been greatly extolled in past times.—Nuck, one of the promoters of this operation, punctured the eye with a trocar, exactly in the centre of the cornea. (*De Duct. Ocul. Aquos, p.* 120.) It has since been thought better to puncture the eye-ball in the sclerotica, at about two lines from the junction of this membrane with the cornea, that such a small quantity of the vitreous humour may be more easily discharged at the same time with the aqueous, as may be deemed adequate to effect a diminution in the morbific enlargement of the eye-ball.

Notwithstanding the approbation, says Scarpa, which the most celebrated surgeons have conferred on this method of operating for the dropsy of the eye, it has at present fallen into disuse, as insufficient, and ineffectual for the purpose. This will not appear surprising to such as are acquainted with our present knowledge of the animal economy, particularly in regard to the lymphatics, and are not ignorant how little reliance can be put in paracentesis, as a means of curing chronic dropsy in general, especially that of the tunica vaginalis, termed hydrocele. Indeed, the radical cure of the latter is never accomplished, except when the adhesive inflammation takes place in the tunica vaginalis and albuginea, after the evacuation of the fluid, or when these membranes suppurate, ulcerate, or contract an intimate adhesion together, which remove every opportunity, every possibility of a fresh accumulation of water in the scrotum. If it has sometimes happened, that the puncture has radically cured the hydrocele, it is because it has, by some unexpected incident, excited inflammation of the *vaginalis* and *albuginea*, so as to produce a coalescence of these two membranes.

In consequence of these principles, (continues Scarpa) the paracentesis of the eye, directed wholly for the discharge of the superfluity of humours in this organ, can never be a means of curing the dropsy of the part, unless the puncture, made by the trocar, excite, at the same time, inflammation and suppuration, and afterwards a concretion of the membranes composing the eye-ball. Indeed Nuck relates, that in a young man at Breda, on whom he had operated, he was obliged to puncture the eye five several times; that, on the fifth time of doing this, it was necessary to suck through the cannula of the trocar, in order to evacuate the greatest possible quantity of the vitreous humour; and, lastly, that it seemed proper to introduce a plate of lead, between the eyelids and eye-ball, for the purpose of making a continual pressure on the eye, in its empty, shrivelled state. In a woman of the Hague, he mentions that he twice punctured the eye in vain; and that this person submitted, two or three other times, to the same operation, but he omits adding with what degree of success. Scarpa has no difficulty in believing, that a radical cure of the dropsy has sometimes been accomplished by means of the puncture, after the trocar, and other similar hard substances, have been repeatedly introduced into the eye, through the cannula of that instrument; but this success can never be attributed to the mere evacuation of the superabundance of the vitreous and aqueous humour; though it may be referred to that, conjoined with the irritation produced by the cannula, and, consequently, to the adhesive inflammation or suppuration excited in the internal membranes of the eye. It is by no means unlikely, that, after having learnt this practical point from experience, and wishing to insure the success of the paracentesis in the radical cure of the dropsy of the eye, Woolhouse may have directed that, when the cannula is introduced into the eye, it should be rolled at least six times between the fingers; and that Platner, following the same steps, may have proposed to inject a warm fluid through the cannula into the cavity of the eye, after having evacuated the humours, by means of a trocar; and that Mauchart may have directed keeping open the wound made in the eye by the trocar, by means of a small tent of lint. If all these circumstances prove, on one side, the inefficacy of the paracentesis in the radical cure of the dropsy of the eye, they evidently shew, on the other, that the perfect cure of this infirmity can only be achieved by evacuating the humours contained in the eye; and exciting, at the same time, a certain degree of inflammation, and suppuration, of the internal membranes of the organ.

The most easy and expeditious way hitherto known, of obtaining all these advantages, is undoubtedly that which is explained in the account of the radical cure of the inveterate staphyloma, protruding out of the eyelids. (See *Staphyloma.*) With respect to this subject, Scarpa cannot refrain from repeating, at this opportunity, that it is exceedingly disadvantageous, and even dangerous, to make the circular section of the dropsical eye-ball in the sclerotica. In fact, this circular recision, when performed in the sclerotica, is constantly followed by the most aggravated symptoms, particularly, frequent hemorrhages, an accumulation of grumous blood at the bottom of the eye-ball, vehement inflammation of the eye, eyelids, and head, obstinate vomitings, convulsions, delirium, and the most imminent danger to the patient's life. Such modern surgeons, as have faithfully published the results of their practice on this point, among whom, Marchan (*Journal de Med. de Paris. Janvier*, 1770. *Sur deux Exophthalmies, ou grosseurs contre nature du Globe de l'Œil.*) and Terras, (*Ibidem; Mars,* 1776. *Sur l' Hydrophthalmie,*) next to Louis, (*Mémoires de Chirurg. t.* 13, *p.* 289, 290.) merit infinite praises, have ingenuously declared that, after performing the circular recision of dropsical eyes in the sclerotica, they have had the greatest motives for repenting of what they had done.

The circular section, as broad, or rather broader than a large lentil-seed, is performed at the summit or centre of the cornea of the dropsical eye, according to Celsus's direction relative to the staphyloma, and is exempt from the serious consequential symptoms that Scarpa has just mentioned. By means of this operation, which is by no means painful, an opening is made for the evacuation of the humours of the eye, and internal inflammation is, at the same time, excited. These objects are accomplished, also, without occasioning such a sudden subsidence, and emptiness, of the membranes of the whole eye, as necessarily happen when a circular incision is made in the sclerotica, and greatly affect the nerves of this organ, and the parts sympathizing with it, particularly the head and stomach. This intimate sympathy, perhaps, is not the least of the causes producing the fatal consequences above specified; besides those very serious ones, which necessarily result from the premature exposure of a large surface of the deeper part of the eye to the contact of the air, and from the lotions which are, in these circumstances, often employed.

With regard to the manual of the operation, it is exactly the same as what is detailed in the article *Staphyloma.* In the dropsical eye, whether the cornea be transparent or not, since the function of the immediate organ of sight is irrevocably lost, as Scarpa has already stated, the surgeon must introduce a small bistoury across the apex, or middle of the cornea, at one line and a half from its central point; and then, by pushing the instrument from one towards the other canthus of the eye, he will cut the lower part of the cornea in a semicircular manner. The segment of the cornea being next elevated with the forceps, the operator is to turn the edge of the knife upward, and complete the work by a circular removal of as much of the centre of the cornea as is equal, in size, to a large lentil-seed, or three lines in diameter, supposing the patient to be in the adult state. Through this circular opening, made in the centre of the cornea, the surgeon may, by means of gentle pressure, discharge as much of the superabundant humours in the eye, as is requisite to make the eye-ball diminish, and return into the orbit, so as to be covered by the eyelids. As for the rest of the humour lodged in the eye, it will gradually escape of itself, through the circular opening in the cornea, without any more pressure being made.

Until the appearance of the inflammation, that is, until the third or fifth day after the operation, the dressings are to consist of the application of a pledget of dry lint, supported by a retentive bandage. As soon as the inflammation and tumefaction invade the eye operated on, and the eyelids, the surgeon is to employ such internal remedies as are calculated to moderate the progress of inflammation; and he is to cover the eyelids with a bread and milk poultice, which must be renewed at least once every two hours. It is a very frequent phenomenon, both in the staphyloma and dropsy of the eye, that, on the first appearance of inflammation, the eye-ball on which the operation has been done, augments, and protrudes again from the eyelids, in the same way as before the operation. In this circumstance, it is proper to cover the projecting part of the eye-ball with a piece of fine linen, smeared with a liniment of oil and wax, or the yolk of an egg, and oleum hyperici; the application of the bread and milk poultice being continued, as before-mentioned, over this other dressing. Scarpa next states, that when suppuration of the interiour of the eye manifests itself, the swelling of the eye-lids at the same time decreases, and the eye-ball diminishes in size, returns gradually into the orbit, and continues to contract itself. This state of suppuration may be known by observing, that the dressings are smeared with a viscid lymph, blended with a portion of the humours of the eye, which incessantly issue from the centre of the cornea; and by noticing the appearance of the margin of the recision, which is changed into a circle of a whitish substance, resembling the rind of bacon. In the progress of the case, this whitish circle, surrounding the place of the recision of the cornea, becomes detached, like a slough, so as to leave a small ulcer, of a very healthy colour. This ulcer, as well as the whole eye-ball, contracts, so as to become entirely closed, and cicatrized, leaving every opportunity for the placing of an artificial eye between the eyelids and the stump of the eye-ball.

Although, in the majority of cases, the circular recision of the centre of the cornea, equal in size to a large lentil-seed, proves sufficient to excite a mild inflammation, and suppuration, in the interiour of the eye of an adult subject; yet, if this occurrence does not take place on the fifth day, it is useful to expose the eye, on which the operation has been done, to the air; or, as is stated in the article *Staphyloma*, it is useful to remove a circular portion of the cornea, half a line in breadth, or little more, by means of the forceps and curved scissars. This gives the patient neither pain nor any other inconvenience, and produces the desired effect, viz. it makes the interiour of the eye, at length, inflame and suppurate mildly, without which it is impossible to effect a perfect cure. (*Scarpa sulle Principali Malattie degli Occhi, cap.* 13.)

**HY'DROPS.** (from ὕδωρ, water.) A dropsy, or morbid accumulation of water. For *hydrops articuli*, refer to *Joints Diseases of*. With regard to *hydrops pectoris, hydrothorax*, or *dropsy of the chest*, as it is altogether a medical case, an account of its symptoms and treatment will hardly be required in this Dictionary. The only concern which a surgeon has with the disease, is being occasionally required to make an opening for the discharge of the water: this operation is described in *Paracentesis Thoracis*.

**HYDROSARCOCELE.** (from ὕδωρ, water; σαρξ, flesh; and κηλη, a tumour.) A morbid enlargement of the testicle, attended with a collection of fluid in the tunica vaginalis.

**HYMEN IMPERFORATE.** The inconveniences brought on by such a cause and the mode of relief, are explained in the article *Vagina*.

A continuation of the hymen over a part of the orifice of the meatus urinarius may produce great pain and difficulty in making water, and symptoms, which may give rise to suspicion of there being a stone in the bladder.

The following case illustrates this observation. "In the year 1740, (says Mr. Warner) I was consulted in the case of a little girl, about three years old, who had long laboured under such severe symptoms in voiding her urine, as to make it suspected by her physician, that she had a stone in her bladder. Upon enquiry, I was informed, that her urine came away by drops, that she was inclined to put her hand to the pudendum when she made water, and that, at that time, she could not help crying and stamping with her feet. These symptoms so nearly resembled those of the stone, that I thought proper to propose the passing a staff into the bladder, that we might be satisfied, whether there was a stone, or any other disease of the urethra, or bladder; but, upon endeavouring to do it, I observed, that the urethra was at least half covered over with a continuation of the hymen, which appeared imperforated; for this reason, I could with difficulty execute my design. However, I effected the introduction of the instrument into the bladder, without using much violence; but, there was no stone, nor any other preternatural appearance to be discovered in the bladder, or the urethra. For this reason, I pronounced, that the difficulties and pains, which arose in discharging the urine, probably proceeded from the size and situation of this membrane; which I divided by incision with a small knife," &c. The patient was cured in a few days. (See *Warner's Cases in Surgery, p.* 276, *edit.* 4.)

**HYPOPYON or HYPOPIUM.** (from ὕπο, under; and ϖυον, pus.)

By hypopium (says Scarpa) I imply, with all surgeons, that accumulation of a glutinous, yellowish fluid, like pus, which takes place in the anterior chamber of the aqueous humour, and, frequently, also in the posterior one, in consequence of severe, acute ophthalmy, particularly the internal species. I have explained, in speaking of inflammation of the eyes, that, though the severe, acute ophthalmy particularly affects the external parts of the eye, in the majority of instances; yet, it occasionally invades, with equal violence, both the external and internal coats of this organ, especially the choroides and uvea. In this last circumstance, if the inflammatory diathesis, affecting the interior of the eye, be not promptly checked and subdued, by the most effectual chirurgical means, coagulating lymph is extravasated from the highly inflamed choroides and uvea, and gradually, as it is effused into the cavity of the eye, it passes through the pupil, into the chambers of the aqueous humour, and descends to the bottom of the anteriour one, so as to fill sometimes one third, sometimes one half of this space;

and, occasionally, to occupy it to such a height, as totally to conceal the iris and pupil.

This viscid matter of the hypopium is commonly called pus; but Scarpa contends that it is only coagulating lymph. The symptoms portending an extravasation of coagulating lymph in the eye, or an hypopium, are the same as those which occur in the highest stage of violent acute ophthalmy: viz. prodigious tumefaction of the eye-lids; the same redness and swelling of the conjunctiva, as in chemosis; burning heat and pain in the eye; pains in the eye-brow and nape of the neck; fever, restlessness, aversion to the faintest light, and a contracted state of the pupil.

As soon as the hypopium begins to form, (says Scarpa) a yellowish semilunar streak makes its appearance at the bottom of the anterior chamber, and, regularly, as the glutinous fluid is secreted from the inflamed internal membranes of the eye, so as to pass through the pupil, and fall into the aqueous humour, it increases in all dimensions, and gradually obscures the iris, first at its inferior part, next, where it forms the pupil, and lastly, the whole circumference of this membrane. As long as the inflammatory stage of the violent ophthalmy lasts, the hypopium never fails to enlarge; but, immediately this stage ceases, and the ophthalmy enters its second period, or that dependent on local weakness, the quantity of coagulating lymph, forming the hypopium, leaves off increasing, and from that moment, is disposed to diminish.

This fact sufficiently evinces (continues this eminent Professor) how important it is, in order to check the progress of the hypopium, to employ, with the utmost care, the most effectual means for checking and resolving the attack of violent ophthalmy in its first stage. Copious evacuations of blood, both generally and topically, ought to be speedily put into practice; and when chemosis exists, the conjunctiva should be divided; mild aperients, blisters to the nape of the neck, little bags of emollient herbs, applied to the eye, and other measures of this kind, described on the subject of the first stage of severe acute ophthalmy, ought to be employed. It will be known that they have fulfilled the indication, by noticing that, some days after the adoption of such treatment, though there may still be redness, of the conjunctiva and eyelids, the lancinating pains in the eye abate, the heat considerably diminishes, the fever subsides, quietude and sleep are restored, the motion of the eye becomes free, and, lastly, the collection of viscid matter forming the hypopium, becomes stationary. It is not unfrequent to see, especially among the lower orders of the people, persons affected with the second stage of severe acute ophthalmy, bearing this collection of coagulating lymph, in the chambers of the aqueous humour, with the greatest indifference, and without complaining of any of those symptoms which characterize the acute stage of ophthalmy. It is only at this crisis, or at the termination of the acute stage of violent inflammation of the eye, that the enlargement of the hypopium ceases, and the coagulating lymph begins to be absorbed, provided this salutary operation of nature be not impeded, nor retarded, by any injudicious regimen.

Scarpa states, that persons, little versed in the treatment of diseases of the eyes, would fancy that the most expeditious and efficacious mode of curing an hypopium, after it has become stationary in the second stage of severe acute ophthalmy, would be that of opening the cornea at its most depending part, in order to procure a speedy exit for the matter collected in the chambers of the aqueous humour; especially, as this is also the common doctrine. But experience shews, that dividing the cornea, in such circumstances, is seldom successful, and most frequently gives rise to evils, worse, than the hypopium itself, notwithstanding the modification suggested by Richter, (*Obs. Chir. Fasc.* 1, *Chap.* 12.) not to evacuate the whole of the matter at once, nor to promote its discharge by repeated pressure, and injections, but to allow it to flow slowly out of itself. The wound made at the lower part of the cornea, for evacuating the matter of the hypopium, how small soever the incision may be, most commonly reproduces the severe acute ophthalmy, and occasions a greater effusion of coagulating lymph into the chambers of the aqueous humour, than existed before. Besides, after opening the cornea, the matter of the hypopium, if allowed to escape gradually, and in drops, of its own accord, would be several days in becoming completely discharged, on account of its viscid quality. During this space of time, the glutinous lymph would keep the edges of the wound of the cornea dilated, and make them suppurate. Thus the incision would be converted into an ulcer, through which the aqueous humour, situated behind the coagulating lymph, would escape, and next even a fold of the iris. Opening the cornea, therefore, only converts the hypopium into an ulcer of that membrane, attended with a prolapsus of the iris, and occasionally of the crystalline itself. Nor can any inference be drawn in favour of making an artificial opening during the stationary state of an hypopium in the second stage of severe acute ophthalmy, from the matter of the hypopium having sometimes made its way spontaneously through a narrow aperture in the cornea, with a successful result. For, there is a wide difference, between the effects of a spontaneous opening into a natural, or preternatural cavity of the animal body, or of one made with caustic, and the consequences of an opening, made with a cutting instrument. In the two first methods, the subsequent symptoms are constantly milder, than in the last. Besides, even in the instance, in which a spontaneous exit of the hypopium takes place through the cornea, an escape of the aqueous humour, and a prolapsus of the iris not unfrequently ensue; consequently, the spontaneous evacuation of the hypopium cannot justly form a rule for the treatment of the disease. There is only one case, in which dividing the cornea, in order to discharge an hypopium, is not only useful, but indispensable: this is, when there is such an immense quantity of coagulating lymph, extravasated in the eye, that the excessive distention, which it produces of all the coats of this organ, occasions such vehement symptoms, as not only threaten the entire destruction of the eye, but, even endanger the life of the patient. But, this particular case cannot serve (says Scarpa) as a model for the treatment of the hypopium, usually met with in practice.

Besides, if it be certain, that blood extravasated in the eye in consequence of blows, and what is still more remarkable, that even the membranous flakes of the capsular cataract, pushed by the needle from the posterior into the anterior chamber, are insensibly dissolved, and, at length, entirely absorbed; if it be the same with milky, and caseous cataracts, that have been lacerated as much as possible; and even with the crystalline lens itself, when deprived of its capsule, and depressed into the vitreous humour by the operation; (see *Cataract;)* there cannot be a doubt, as Scarpa states, that absorption will take place, in the case of coagulating lymph extravasated into the chambers of the aqueous humour, as soon as the source of this extravasation of glutinous fluid no longer exists, and the lymphatics of the eye have recovered their original energy.

Hence, the resolution of the hypopium, by means of absorption, forms the primary indication, at which the surgeon should aim in the treatment of the complaint. We have already observed, that, in order to stop its progress, the only truly efficacious method is to subdue the first shock of the inflammation, and to shorten the acute stage of the severe ophthalmy, by the free employment of the antiphlogistic treatment, and the use of mild, emollient, topical remedies.

If this plan of treatment answer the wishes of the practitioner, (continues Scarpa) as in the majority of cases it does, the incipient collection of coagulating lymph, at the bottom of the anterior chamber of the aqueous humour, not only ceases to augment, but, also, in proportion as the severe ophthalmy disappears, the absorbent system takes up the heterogeneous fluid extravasated in the eye, and the white, or yellow speck, shaped like a crescent, situated at the bottom of the anterior chamber, gradually diminishes, and is at last entirely dispersed. Janin considered the infusion of the flowers of mallows, applied to the eye that is inflamed and affected with this disease, as a specific resolvent in these circumstances (*Mem. et Obs. sur l'Œil, p.* 405;) but, it is now known, that every topical emollient application, provided it be conjoined with such internal antiphlogistic treatment, as is the most proper for repelling the acute stage of the severe ophthalmy, produces quite as good an effect as this infusion. Simple warm water produces the same benefit. "A young girl, (writes the celebrated practioner Nannoni) was struck in the eye by an ear of corn. An inflammation was the consequence, which produced a white pus of a semilunar shape, apparently behind the cornea, without a possibility of judging, whether the matter was actually situated between the laminæ of that membrane, or in the anterior chamber. Hence, I was asked whether it might not be evacuated by an incision, particularly, as the patient complained of great pain in the eye, and eye-brow. She was in the hospital; and in the presence of Dr. Lulli, and several students in surgery, I said that the pain of which the patient complained, was not occasioned by the pus itself, but the cause which produced it. This cause was inflammation, which probably would be increased by making a larger opening for the external air, than what it has to the internal parts, while the external ones remain entire. By fomenting the eye and forehead with warm water, the inflammation subsided, and the pus disappeared. We have so often witnessed the fact subsequently, that we can also extol the simplicity of the treatment." Such, in short, is the happy termination of an hypopium, whenever the disease is properly treated at its commencement, and the acute stage of the severe ophthalmy has been promptly checked and repelled by internal antiphlogistic means, and emollient applications to the eye. But, in consequence of the inflammatory period of the severe ophthalmy having resisted in an uncommon manner the best means, or because such means have been employed too late, it sometimes happens, that the coagulating lymph, effused in the eye, and collected in the anterior chamber, is so abundant, even after the acute stage of the ophthalmy, that it continues for a long time to cloud the eye, and intercept vision. Scarpa has often seen patients, especially paupers, who from indolence, negligence, or ill treatment, have remained, a long time after the cessation of the inflammatory stage of ophthalmy, with the anterior chamber almost entirely filled with the glutinous matter of hypopium. When the inflammation ceases, these unhappy persons wander about the streets almost quite indifferent, and without complaining of pain, or any other inconvenience, than the difficulty of seeing with the eye affected. In this second stage of the ophthalmy, the resolution of the hypopium obviously cannot be accomplished by the same means, nor with equal celerity, as in the first. At this crisis, the great quantity, and density of the glutinous matter extravasated, and the atony of the vascular system of the eye, make it necessary to give nature sufficient time, to dissipate the thick, tenacious matter of the hypopium, and, at length, to dispose it to be insensibly absorbed with the aqueous humour which is continually undergoing a renovation. Hence, it is right, (says Scarpa) to adopt those means, which are best calculated to invigorate the debilitated tone of the vascular system of the eye, more especially the lymphatics. This requires more or less time, according as the patient is advanced in years, of a relaxed fibre, and weak; or a young man of good constitution.

However, in the second stage of violent acute ophthalmy, complicated with hypopium, the surgeon, according to Scarpa, should limit his efforts to the removal of every thing, which may irritate the eye, or be likely to renew the inflammation; and he should only employ such means, as are conducive to the resolution of the second inflammatory stage, depending on relaxation of the conjunctiva and its vessels, and such remedies as tend, at the same time, to invigorate the action of the absorbents. Therefore, in this state, he ought first to examine carefully the degree of irritability in the eye affected with the hypopium, by introducing, between the eye and eyelids, a few drops of vitriolic collyrium, containing the mucilage of quince-seeds. Should the eye seem too strongly stimulated by this application, it must not be used, and little bags of warm mallows with a few grains of camphor are to be substituted for it. In the intervals, the vapours of the spir. ammon. comp. mentioned in the article *Ophthalmy*, may be applied, and recourse had again to a blister on the nape of the neck. When the extreme sensibility of the eye is overcome, the simple vitriolic collyrium must be used again, strengthening it afterwards by the addition of a few drops of camphorated spirit of wine. Under such treatment, proceeds Scarpa, the surgeon may observe, that, in proportion as the chronic ophthalmy disappears, and the action of the absorbents is re-excited, the tenacious matter of the hypopium divides first into several small masses; then dissolves still further; and, afterwards, decreases in quantity; descending towards the inferior segment of the cornea; and, finally, vanishing altogether. But Scarpa accurately observes, that the surgeon cannot always expect to be equally successful, whether the disease occur during the first, or second stage of violent acute ophthalmy, if the tenacious lymph, suddenly extravasated in the interior of the eye, prevail in such quantity, as not only to fill, but strongly distend, the two chambers of the aqueous humour, and the cornea in particular. Notwithstanding the most skilful treatment, in this state of the complaint, the unpleasant complication is often followed by another inconvenience, still worse than the hypopium itself; viz. ulceration, opacity, and bursting of the cornea, at that point of its circumference, or centre opposite the pupil, where there is the smallest resistance to the pressure.

The ulceration of the cornea ordinarily takes place with such celerity, that the surgeon seldom has time to prevent it. As soon as an aperture has formed, the excessive abundance of coagulating lymph, contained in the eye, (sometimes named empyema oculi) begins to escape through it, and a degree of relief is experienced. But, this melioration is not of long continuance; for, scarcely is the glutinous fluid evacuated, that distended the whole eye, and especially the cornea, when it is followed by a portion of the iris, which glides though the ulcerated aperture, protrudes externally, and constitutes the disease termed, prolapsus of the iris. (See *Iris, Prolapsus of.*) But, if in such an emergency, the cornea already ulcerated, opaque, and greatly deranged in its organization, should not immediately burst, the surgeon is then constrained by the violence of the symptoms, depending on the prodigious distention of the eyeball, to make an artificial opening in this membrane, in order to relieve the immense constriction, and even the danger in which life is placed. The practitioner will do this the more readily, as, in such circumstances, there is little hope of preserving the organ of vision. Scarpa adds, that the pain in the eye, and whole head, is often so severe in this case, as to cause delirium.

Were there the least chance of restoring, in any degree, the transparency of the cornea, and the functions of the organs of vision, after opening the cornea, it would certainly be more prudent to make the opening at the lower part of this membrane, as is practised in the extraction of the cataract. But, in the case of empyema of the eye, now considered, in which the cornea is universally menaced with ulceration and opacity, and seems ready to slough, there is no hope of its resuming its transparency at any point. The best, and most expeditious, method of relieving the patient from the terrible pain, which he suffers, is, according to Scarpa, to divide the centre of the cornea with a small bistoury to the extent of a line and a half; then to raise with a pair of forceps the little flap, and cut it away all round with one stroke of the scissars, so as to make in the middle of this membrane an opening of about the size of a lentil-seed.

The most fluid part of the matter, distending the eye, immediately escapes through this opening, the lips of which cannot close, like those of a simple incision. Successively afterwards, the coagulating lymph, and the crystalline lens, take the same course, and also, in a few days, the vitreous humour. The surgeon should refrain from promoting the escape of the latter by strong pressure on the eyeball; experience proves, that, in such cases, it is best to allow it to flow out spontaneously.

Immediately after the operation, the surgeon must cover the eye with a bread and milk poultice, which is to be renewed every two hours, not neglecting the use of such general remedies, as are calculated to check the progress of acute inflammation, and to quiet the alarm of the nervous system. In proportion as the interior of the eye suppurates, the eye-ball gradually diminishes, shrinks into the orbit, and at length cicatrizes, leaving things in a favourable state for the application of an artificial eye.

However, Scarpa infers from the whole of what has just been said, that making an incision into the cornea, is as dangerous, and useless, in the case of hypopium ordinarily met with in practice, as it is necessary in the instance of empyema of the eye, attended with the aggravating symptoms above-mentioned, and irremediable opacity of the cornea.

The foregoing remarks, which are some of the best ever offered on the subject, were first published by Professor Scarpa in *Saggio di Osservazioni e d'Esperienze, sulle Principali Malattie degli Occhi; Venezia*, 1802. Another excellent writer on hypopium is Richter: see *Anfangsgrunde der Wundarzneykunst, Band.* 3. 1795. Consult also *Essays on the morbid Anatomy of the Human Eye: by J. Wardrop, Chap.* 6. *Edinb.* 1808.

**HYSTEROTOMIA.** (from ὑστερα, the womb, and τεμνω, to cut.) See *Cæsarean Operation.*

# I.

**IMPERFORATE HYMEN.** See *Vagina.*

**INCARCERATION** (from *incarcero,* to confine.) This term is usually applied to cases of hernia, in the same sense as strangulation. When the viscera are pressed upon either by the opening through which they protrude, or by the parts themselves within the hernial sac, in such a degree, that the course of the intestinal matter to the anus is obstructed, and nausea, sickness, pain, and tension of the swelling and abdomen, &c. are occasioned, the rupture is said to be affected with incarceration, or strangulation.

According to Professor Scarpa, however, an *incarcerated,* and a *strangulated* hernia, do not imply exactly the same thing. In the first case, says he, the course of the intestinal matter is interrupted, without any considerable impairment of the texture, or vitality of the bowel. On the contrary, in the strangulated hernia, besides the obstruction to the course of the fecal matter, there is organic injury of the coats of the intestine, with loss of its vitality. The bowel, that is merely incarcerated, resumes its functions immediately it is replaced in the abdomen; while that, which is truly strangulated, never returns to its natural state. (See *Scarpa's Traité des Hernies, p.* 251.)

This distinction, however, which Scarpa has drawn, is by no means generally adopted, *incarceration,* and *strangulation* being used as synonymous terms.

**INCONTINENCE OF URINE.** See *Urine, Incontinence of.*

**INFLAMMATION.** (from *inflammo,* to burn.) By the term, *inflammation,* is generally understood, the state of a part, in which it is painful, hotter, redder, and somewhat more turgid, than it naturally is; which topical symptoms, when present in any considerable degree, or when they affect very sensible parts, are attended with fever, or a general diseased action of the system. (*Burns.*)

The susceptibility of the body for inflammation is of two kinds; the one *original*, constituting a part of the animal economy, and beyond the reach of human investigation; the other *acquired* from the influence of climate, habits of life, and state of the mind over the constitution. (*Hunter.*) The first kind of susceptibility, being innate, cannot be diminished by art; the second may be lessened by the mere avoidance of the particular causes, upon which it depends.

Inflammation may, with great propriety, be divided into the *healthy* and *unhealthy*. Of the first, there can only be one kind; of the second, there must be an infinite number of species, according to the peculiarities of different constitutions, and the nature of diseases, which are numberless. (*Hunter.*) Inflammation may also be divided into the *acute* and *chronic*. This division of the subject is one of the most ancient, and seems to have obtained the sanction of all the best surgical writers. Healthy inflammation is invariably quick in its progress, for which reason, it must always rank as an *acute* species of the affection. However, there are numerous inflammations, controlled by a diseased principle, which are quick in their progress, and are, therefore, to be considered as acute. Chronic inflammation, which we shall treat of, when we come to the subject of *tumours*, is always accompanied with a diseased action.

## PRINCIPLES OF INFLAMMATION.

There is much foundation for believing, that healthy inflammation is invariably an homogeneous process, obedient to ordained principles, and, in similar constitutions *, similar structures, and similar situations, uniformly assuming the same features. If experience reveals to us, that *here* it is commonly productive of certain effects, and *there* it ordinarily produces different ones, the same unbounded source of wisdom communicates to the mind a knowledge, that there is some difference in the tone of the constitution, or in the structure or situation of the parts affected, assignable as the cause of this variety. The nature of the exciting cause can have no share in modifying the appearances of phlegmonous inflammation, whether this be occasioned by the application of heat, or of mechanical violence to the body. Healthy inflammation is always the same in its nature, and all the influence, which the exciting causes can have, is proportioning the degree of inflammation to their own violence. A modern author (*Dr. Smith, in Med. Communications, Vol.* 2.) makes the nature of the exciting cause one principal ground of the specific distinctions in inflammation, and, with good reason, when he takes into the account the action of morbid poisons, and the qualities of disease in general.

The attentive observation of experience, the only solid basis of all medical, as well as other, knowledge, has informed the practitioner, that parts, which from their vicinity to the source of the circulation, enjoy a vigorous circulation of blood through them, undergo inflammation more favourably, and resist disease better, than other parts, of similar structure, more remote from the heart. The lower extremities are more prone to inflammation, and disease in general, than parts about the chest; when inflamed, they are longer in getting well; and the circumstance of their being depending parts, which retards the return of blood through the veins, must also increase the backwardness of such parts in any salutary process. (*Hunter.*) Healthy inflammation is of a pale red; when less healthy, it is of a darker colour; but, the inflamed parts will, in every constitution, partake more of the healthy red, the nearer they are to the source of the circulation. (*Hunter.*)

Inflammation, when situated in highly organized and very vascular parts, is more disposed to take a prosperous course, and is more governable by art, than in parts of an opposite texture. The nearer also such vascular parts are to the heart, the greater will be their tendency to do well in inflammation. (*Hunter.*) Hence, inflammation of the skin, cellular substance, muscles, &c. more frequently ends favourably, than the same affection of bones, tendons, fasciæ, ligaments, &c. It is also more manageable by surgery; for those parts of the body, which are not what anatomists term *vascular*, seem to enjoy only inferior powers of life, and, consequently, when excited in a preternatural degree, frequently mortify.

But, inflammation of vital parts, though these may be exceedingly vascular, cannot go on so favourably, as in other parts of resembling structure, but, of different functions; because, the natural operations of universal health depend so much upon the sound condition of such organs. (*Hunter.*) The truth of this observation is illustrated in cases of gastritis, peripneumony, &c

All new-formed parts, not originally entering into the fabric of the body, such as tumours, both of the encysted and sarcomatous kinds, excrescences, &c. cannot endure the disturbance of inflammation long, nor in a great degree. The vital powers of such parts are weak, and when irritated by the presence of inflammation, these adventitious substances are sometimes removed by the lymphatics, but more commonly slough. This remark applies also to substances generated as substitutes for the original matter of the body; for instance, granulations and callus. The knowledge of this fact, leads us to a rational principle of cure in the treatment of several surgical diseases. Do we not here perceive the cause, why very large wens are occasionally dispersed by the application of urine, brine, and similar things, which are now in great repute, on this account, with almost every one out of the profession? How many verrucæ, wrongly suspected to originate from a syphilitic cause, are diminished and cured by a course of mercury! It is the stimulus of this mineral upon the whole system, that accomplishes the destruction of these adventitious substances—not its antivenereal quality. Topical stimulants would fulfil the same object, not only with greater expedition, but with no injury to the general health.

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* Here strength and weakness are alluded to; for, it is impossible that healthy inflammation should prevail in a diseased constitution.

Inflammation, *cæteris paribus*, always proceeds more favourably in strong, than in weak constitutions; for, when there is much strength, there is little irritability. In weak constitutions, the operations of inflammation are backward, notwithstanding the part, in which it is seated, may, comparatively speaking, possess considerable organization, and powers of life. (*Hunter.*)

Healthy inflammation, wherever situated, is always most violent on that side of the point of inflammation, which is next to the external surface of the body. When inflammation attacks the socket of a tooth, it does not take place on the inside of the alveolary process, but towards the cheek. When inflammation attacks the cellular substance, surrounding the rectum, near the anus, the affection usually extends itself to the skin of the buttock, leaving the intestine perfectly sound, though in contact with the inflamed part. (*Hunter.*)

We may observe the influence of this law in the fistula lachrymalis, in diseases of the frontal sinuses, and antrum, and, particularly, in gun-shot wounds. Suppose a ball were to pass into the thigh, to within an inch of the opposite side of the limb, we should not find, that inflammation would be excited along the track of the ball, but, on the side next the skin which had not been hurt. If a ball should pass quite through a limb, and carry into the wound a piece of cloth, which lodges in the middle, equidistant from the two orifices, the skin, immediately over the extraneous body, would inflame, if the passage of the ball were superficial.—(*Hunter.*) Mr. Hunter compared this law with the principle, by which vegetables approach the surface of the earth; but, the solution of it was even too arduous for his strong genius and penetration.

We see three very remarkable effects follow the prevalence of inflammation; viz. adhesions of parts of the body to each other; the formation of pus, or suppuration; and ulceration, a process, in which the lymphatics are more concerned, than the blood-vessels. Hence, Mr. Hunter termed the different stages of inflammation, the *adhesive*, the *suppurative*, and the *ulcerative*.

All parts of the body are not equally liable to each of the preceding consequences. (*Hunter.*)

In the cellular membrane, and in the circumscribed cavities, the adhesive stage takes place more readily, than the others; suppuration may be said to follow next in order of frequency; and lastly ulceration.

In internal canals, on the inner surfaces of the eye-lids, nose, mouth, and trachea, in the air-cells of the lungs, in the œsophagus, stomach, intestines, pelvis of the kidneys, ureters, bladder, urethra, and in all the ducts and outlets of the organs of secretion, being what are termed *mucous membranes*, the suppurative inflammation comes on more readily, than either the adhesive, or the ulcerative stage. Adhesions, which originate from the slightest degree of inflammation in other situations and structures, can only be produced by a violent kind in the above-mentioned parts. Ulceration is more frequently met with upon mucous surfaces, than adhesions. (*Hunter.*) The cellular membrane appears to be much more susceptible of the adhesive inflammation, than the adipose, and much more readily passes into the suppurative. (*Hunter.*) Thus we see the cellular substance, connecting the muscles together, and the adipose membrane to the muscles, inflaming, suppurating, and the matter separating the muscles from their lateral connexions, and even the fat from the muscles, while the latter substance and the skin are only highly inflamed. (*Hunter.*) But, it must be allowed, that in situations where fat abounds we very frequently meet with abscesses. This is so much the case, that fat has been accounted a more frequent nidus for collections of matter, than the cellular substance. (*Bromfield.*) Abscesses are particularly liable to form in the neighbourhood of the anus, mamma, &c. We have mentioned above the fat's being highly inflamed; an expression not strictly true. Fat has no vessels, principle of life, nor action of its own; consequently, we cannot suppose it can itself either inflame, or suppurate. We know, that it is itself a secretion, and when an abscess forms in it, we understand, that the mode of action in the vessels, naturally destined to deposit fat, has been altered to that adapted to the formation of pus. When we speak of the fat being inflamed, we imply, that the membranous cells, in which it is contained, and by which it is secreted, are thus affected.

The deeply-situated parts of the body, more especially the vital ones, very readily admit of the adhesive stage of inflammation. The circumstance of deeply-seated parts not so readily taking on the suppurative stage of inflammation, as the superficial ones do, is strikingly illustrated in cases of extraneous bodies, which, if deeply lodged, only produce the adhesive inflammation. By this process a cyst is formed, in which they lie without much inconvenience, and they may even gradually change their situation, without disturbing the parts, through which they pass. But, no sooner do these same bodies approach the skin, than abscesses immediately arise. (*Hunter.*)

All inflammations, attended with disease, partake of some specific quality, from which simple inflammation is entirely free. When the constitution allows the true adhesive and suppurative stages to occur, it is to be regarded as the most healthy. Were it in an opposite state, we should see the very same irritation excite some other kind of inflammation, such as the erysipelatous, scrophulous, &c. (*Hunter.*)

In specific inflammations, the position, structure, and distance of the part affected from the source of the circulation, as well as from the surface of the body, seem also to have as much influence as in cases of common inflammation. Upon this point, I feel conscious of being a little at variance with what Mr. Hunter has stated; but the undecided manner in which he expresses himself, not less than the following reflections, encourages me not to desert my own ideas. We see, that venereal eruptions sooner make their appearance upon the chest and face, than upon the extremities. No organized part can be deemed exempt from the attack of common inflammation; many appear to be totally insusceptible of the venereal. We know, that scrophulous diseases of the superior extremities take a more favourable course, require amputation less frequently, and get well oftener than when situated in the inferior limbs. (*Ford.*) The venereal disease makes more rapid advances in the skin and throat, than in the bones and tendons; we often see it producing a specific inflammation, and an enlargement of the superficial parts of the tibia, ulna, clavicle, cranium, &c. while other bones, which are covered with a considerable quantity of flesh, are very rarely affected. Gouty inflammation is prone to invade the small joints; rheumatic, the large articulations.

### SYMPTOMS AND NATURE OF HEALTHY INFLAMMATION, OR PHLEGMON.

Redness, swelling, heat, and pain, the four principal symptoms of phlegmonous inflammation, have been accurately noticed by Celsus*. If we refer to any writer on this interesting part of surgery, we shall find the above symptoms enumerated as characterizing phlegmon. In short, this term is usually applied to a circumscribed tumour, attended with heat, redness, tension, and a throbbing pain. These are the first appearances observed in every case of phlegmon; and when they are slight, and the part affected is of no great extent, they have commonly very little, and sometimes no apparent, influence on the general system. But, when they are more considerable, and the inflammation becomes extensive, a full, quick, and generally a hard pulse, takes place, and the patient, at the same time, complains of universal heat, thirst, and other symptoms of fever. While the inflamed part becomes red, painful, and swelled, its functions are also impaired. The same degree of inflammation is said to produce more swelling in soft parts, and less in those of a harder structure. (*Burns.*)

Though the redness, swelling, throbbing, tension, and other symptoms of phlegmonous inflammation, are less manifest, when the affection is deeply situated, yet they certainly exist. When persons die of peripneumony, or inflammation of the lungs, the air-cells of these organs are found crowded with a larger number of turgid blood-vessels, than in the healthy state, and of course the parts must appear preternaturally red. Coagulating lymph, and even blood, are extravasated in the substance of these viscera, which become heavier, and feel more solid. (*Baillie.*)

The extravasation of coagulating lymph, which is one of the chief causes of the swelling, is also one of the most characteristic signs of phlegmonous inflammation.

Some writers (*Smith, Med. Commun.*) have confined the seat of phlegmon to the cellular membrane; but, this idea is probably an erroneous one. Had such authors duly discriminated the nature of common inflammation, they would have allowed, that this affection existed, wherever the blood-vessels appeared to be more numerous, and enlarged, than in the natural state, accompanied with an effusion of coagulating lymph, whether upon the surface of a membrane, or a bone, or into the interstices of the cellular substance, and attended with acute pain, and a throbbing pulsation in the part affected.

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* Notæ verò inflammationis sunt quatuor, rubor, et tumor, cum calore et dolore, lib. 3. cap. 10.

Before proceeding further into the consideration of inflammation, it seems proper to treat of causes.

### REMOTE CAUSES.

As Dr. Thomson has observed, the epithet remote, as applied to the causes of inflammation, does not appear to be happily chosen; for, under this term, are comprehended all those agents, events, and states, which contribute immediately, as well as remotely, directly as well as indirectly, to the production of the affection. (*Lectures on Inflammation, p.* 50.)

The remote causes of inflammation are infinite in number; but, very easy of comprehension, because only divisible into two general classes. The first includes all such agents as operate by their stimulant or chemical qualities; for instance, cantharides, heat, the action of concentrated acids, alkalies, metallic oxides, and metallic salts, acrid vapours, such as ammoniacal gas, the nitrous, sulphureous, muriatic, oxygenated muriatic gases, &c. alcohol, æther, and all acrid, vegetable essential oils, animal poisons, and the whole of that class of substances known by the name of rubefacients. (See *Thomson's Lectures on Inflammation, p.* 55.) The second class of causes are those, which act mechanically, such as bruises, wounds, pressure, friction, &c.

Fevers often seem to become the remote causes of local inflammation. In other instances, inflammation appears to arise spontaneously, or, as I should rather say, without any perceptible exciting cause.

The principle, on which the application of cold to a part becomes the remote cause of inflammation, is not decidedly known. "No subject, (says a distinguished professor) is more deserving of your study, than the effects, which are produced in the human body by the operation of cold applied to its surface; but, the subject is at the same time, exceedingly extensive, complicated, and difficult. These effects differ according to the degree, in which the cold is applied, the state of the system, the part of the body to which it is applied, and the mode of its application. So diversified, indeed, are these effects, that it requires no mean confidence in theoretical reasoning to believe, that the operation of cold in producing them is explicable upon any single general principle." (See *Thomson's Lectures on Inflammation, p.* 58.) And in the preceding page, he observes: "The operation of cold upon the human body affords the best example, which I can suggest to you, of the production of inflammation from the operation of a power acting upon a part at a distance from that, in which the inflammation takes place. The instances formerly mentioned of inflammation of the throat, chest, or belly, from the application of cold to the feet, are daily occurrences in these climates, of which it is impossible for us, in the present state of our knowledge of the animal economy, to give any thing like a satisfactory explanation.

"In some instances, cold, or a diminution of temperature, seems to act more directly upon the parts, with which it comes into contact. We have examples of this in the inflammation of the mucous membranes of the nose, fauces, trachea, and bronchiæ, from the inhalation of cold air; and in the production of rheumatic inflammation from the accidental exposure of some part or other of the body to cold. The application of cold, in the instances I have mentioned, seems to have somewhat of a directly exciting effect; and perhaps the same remark is still more applicable to the local effects of cold in the production of the inflammation accompanying the state, which is usually denominated frost-bite. Touching a solid body, as a piece of metal, the temperature of which has been greatly reduced, produces a sensation like that of burning, and may be followed, like the application of fire, with a blister." (*Op. cit.*)

### PROXIMATE CAUSE.

Numerous opinions have been entertained upon this subject; but, almost every theory has been built upon the supposition of there being some kind of obstruction in the inflamed part.

While the circulation of the blood was unknown, and the hypothetical notions of the power of the liver, in preparing and sending forth, this fluid, continued to prevail, it is not astonishing that the theories of physic should be exceedingly imperfect. So fully persuaded were physicians of the existence and influence of different humours and spirits, and so little did they know of the regular and constant motion of the blood, that they believed in the possibility of depositions and congestions of the blood, the bile, or lymph; and acknowledged these as the cause of inflammation. Their anatomists taught them, and their professors of physic supported the opinion, that the liver was the centre of the vascular system, from which the blood went forth by day to the extremities, and returned again by night. If then any peccant matter irritated the liver, the blood was sent out more forcibly; and if, at the same time any part of the body were weakened, or otherwise disposed to receive a greater quantity of fluid than the rest, then a swelling was produced by the flow of humours to this place. Fluxions, or flows of humour to a place, might happen either from weakness of the part which allowed the humours to enter more abundantly, or from the place attracting the humours, in consequence of the application of heat or other agents. (*Burns.*)

The peculiar nature of the swelling thus occasioned was supposed, by the ancients, to depend upon the kind of humour. Blood produced the true phlegmon; bile, erysipelas; &c.

The ancient physicians also entertained an idea, that the blood and humours might slowly stagnate in a part, from a want of expulsive power, and this affection was termed a *congestion*, while the expression *fluxion* or *defluxion* was used to denote any swelling arising from the sudden flow of humours from a distant part. The first was formed gradually without much pain, or the feeling of pulsation, and run its course slowly; the second appeared suddenly, was very painful, had a pulsatory feel, and was rapid in its progress. The ancients, who supposed that the blood had very little motion, and that its course could be easily directed or changed, recommended bleeding from some part which was remote from a recent inflammation, by which they imagined that the current of blood was altered, and a *revulsion* made. A revulsion was also made by raising a tumour in some other part, by means of ligatures, cupping-glasses, &c. or by giving nature an opportunity of discharging the humours from distant parts, by applying leeches or blisters. Hence sinapisms were applied to the feet, in disease of the superior parts. (*Burns.*)

When blood was drawn from the vicinity of the fluxion, or congestion, the mode was called *derivation*, which only differed from *revulsion* in the distance to which the humour was drawn being less. (*Burns.*)

I shall not enter further into an account of the practice of the ancients in the treatment of inflammation; but shall refer the reader to what Mr. Burns has written on the subject. Our present object is only to trace the leading doctrines, which have at different times prevailed, respecting the proximate cause of inflammation.

From the theories of *fluxion* and *congestion*, which were quite incompatible with the laws of the circulation of the blood, we turn our attention to the doctrine of *obstruction*.

Boerrhave inculcated, (*Aph.* 375 *et seq.*) that inflammation was caused by an obstruction to the free circulation of the blood in the minute vessels, and this obstruction, he supposed, might be caused by heat, diarrhœa, too copious flow of urine, and sweat, or whatever could dissipate the thinner parts of the blood, and produce a thickness or viscidity of that fluid. When the lentor did not exist before the production of inflammation, he imagined, that the larger globules of the blood, got into the small vessels, and thus plugged them up. When, for instance, the perspiration was stopped, the fluid, being retained, dilated the vessels, and allowed some of these mischievous globules to enter, and produce a more permanent obstruction. This circumstance was termed an *error loci*, and was one of the chief causes assigned for inflammation. The obstruction, whether caused by *viscidity* or an *error loci*, was imagined to occasion a resistance to the circulation in the part affected; hence increased it in the other vessels, proving an irritation to the heart, and augmenting the force or attraction of the blood in that part of the vessel which was behind the obstruction. This caused heat and pain, while the accumulation of the blood produced redness; which three symptoms are the essence of the disease. Besides *obstruction*, Boerrhave also brought into the account an *acrimonious state of the fluids*, which rendered resolution out of the question, and gangrene likely to follow. (*Aph.* 388.)

The viscidity of the blood cannot be admitted as the proximate cause of inflammation; because we have no proof, that this state ever exists; or, granting that it did, it would not explain the phenomena. Were a viscidity to occur, it would exist in the whole mass of blood, would affect every part of the body alike, and could not be supposed to produce only a local disorder. How also could such a lentor be produced by causes which bring on inflammation suddenly, without there being time for changes of the fluids to take place? (*Burns.*)

With regard to the doctrine of *error loci*, or of red globules going into vessels, which did not formerly transmit them, the fact must be admitted, at the same time, that the conclusion is denied. When the eye becomes inflamed, the tunica conjunctiva is seen with its vessels full of red blood, which in health is not the case; but this redness never appears until the inflammation has commenced, and must therefore, be considered as an effect, not a cause. Nor can this error loci occasion any obstruction in these vessels; for, if they be divided, the blood flows freely, which shews, that they are large enough to allow an easy circulation. (*Burns.*)

Boerrhave's theory of obstruction was too circumscribed, and too mechanical; it reduced all inflammations to one species. The only distinctions which could have arisen, must have proceeded from the nature of the obstruction itself. This doctrine could never account for the action of many specific diseases and morbid poisons. (*Hunter.*)

As for the supposition of the co-operation of an *acrimony of the fluids*, the proportion of the saline matter of the blood has never been proved to be greater in this, than in any other state of the body. (*Burns.*) Even were a general disorder of this kind to be admitted, no rational explanation of the proximate cause of local inflammation could be deduced from it.

Dr. Cullen attributed the proximate cause of inflammation to a "spasm of the extreme arteries supporting an increased action in the course of them." This theory only differs from that of Boerrhave in the cause which is assigned for the obstruction. Some causes of inequality in the distribution of the blood, may throw an unusual quantity of it upon particular vessels, to which it must necessarily prove a stimulus. But, farther, it is probable, that to relieve the congestion, the vis medicatrix naturæ increases still more the action of the vessels; and which, as in all other febrile diseases, it affects, by the formation of a spasm on their extremities." "A spasm of the extreme arteries, supporting an increased action in the course of them, may, therefore, be considered as the proximate cause of inflammation; at least, in all cases not arising from direct stimuli applied; and, even in this case, the stimuli may be supposed to produce a spasm of the extreme vessels." (*Cullen.*)

The inconsistencies in Cullen's theory are very glaring. The congestion or accumulation of blood, which is only an effect or consequence of inflammation, is set down as the cause of the spasm of the vessels, to which spasmodic constrictions Cullen, strangely enough, assigns the name of proximate cause. The spasmodic contraction of the extremities of the vessels, instead of propelling the accumulated quantity of blood, would render the passage of the blood from the arterial into the venous system still more difficult. Spasmodic constriction of the small vessels is so far from being a satisfactory explanation of the proximate cause of inflammation, that even tying a large vessel does not of itself bring on the affection. Phlegmon is also attended with an effusion into the cellular substance from the extremities of the arteries; a circumstance not easily explained upon the principle of obstructed circulation. (*Burns.*)

We shall now notice the celebrated, and very original opinions promulgated on this subject by John Hunter. According to him inflammation is to be considered only as a disturbed state of parts, which requires a new, but salutary mode of action, to restore them to that state, wherein a natural mode of action alone is necessary. From such a view of the subject, therefore, inflammation in itself is not to be considered as a disease, but as a salutary operation, consequent either to some violence or some disease. Elsewhere, the author remarks, the act of inflammation is to be considered as an increased action of the vessels, which, at first, consists simply in an increase or distention beyond their natural size. This increase seems to depend upon a diminution of the muscular power of the vessels, at the same time that the elastic power of the artery must be dilated in the same proportion. This is, therefore, something more than simply a common relaxation: we must suppose it an action in the parts to produce an increase of size, to answer particular purposes, and this Mr. Hunter would call an act of dilatation. The whole is to be considered as a necessary operation of nature. Owing to this dilatation, there is a greater quantity of blood circulating in the part, which is according to the common rules of the animal economy; for, whenever a part has more to do than simply to support itself, the blood is there collected in larger quantity. The swelling is produced by an extravasation of coagulable lymph, with some serum; but, this lymph differs from the common lymph, in consequence of passing through inflamed vessels. It is this lymph which becomes the uniting medium of inflamed parts; vessels shoot into it; and it has even the power of becoming vascular itself. The pain proceeds from spasm. The redness is produced either by the arteries being more dilated than the veins, or because the blood is not changed in the veins. When a part cannot be restored to health, after injury, by inflammation alone, or by adhesion, then suppuration, as a preparatory step to the formation of granulations, and the consequent restoration of the part, takes place. The vessels are nearly in the same state as in inflammation; but they are more quiescent, and have acquired a new mode of action.

"The mechanical and chemical causes of inflammation (as a modern author observes) seem all to concur in producing an increased flow of blood to the part, to which they are more immediately applied. The causes, also, which indirectly excite inflammation, seem to produce that state by acting in a similar manner. This local increased flow of blood, produced by the exciting causes of inflammation, was taken notice of by Hippocrates; and has served, if I am not mistaken, as the principal basis for the various, and, in some respects, contradictory hypotheses, which have at different times been employed to explain that state of the sanguiferous system in the inflamed parts, upon which the phenomena peculiar to inflammation immediately depend. *This is the state, which has been usually, though perhaps improperly, denominated the proximate cause of inflammation.*"—(*Thomson on Inflammation, P.* 61.)

That there is an increased action of the vessels in most cases of inflammation is an opinion, which has now gained very general belief. It is a doctrine, which appears to derive support from a review of the several exciting causes of the affection, which, being in general of an irritating nature, must, when applied to any living, or sensible parts, occasion a preternatural action of the vessels. The method of cure also tends to confirm the opinion. But, to say that such increased action of the vessels is the proximate cause of inflammation, is making an unproved, and, in all probability, an inaccurate assertion. Where so many parts are affected, arteries, veins, lymphatics, nerves, &c. why should every thing be exclusively referred to the increased action of the arteries? But, nothing can be more certain, than that increased action of the arteries, does not of itself constitute inflammation. In gestation, the arteries of the womb are enlarged and affected with increased action; yet this organ is not inflamed. The carotids are in a similar state during the growth of the stag's horn; but no inflammation occurs.

Hitherto, I have been speaking as if the increased action of the vessels in inflammation were certain and unquestionable. But we may now remark, that although it is commonly believed in this country, and has been exaggerated into the proximate cause of the affection, it is not universally admitted even to exist.

" There are (says a learned professor) two hypotheses, which at present divide the opinions of pathologists, respecting the state of the capillary vessels affected with inflammation. According to the first of these hypotheses, the inflamed vessels are in a state of increased action; according to the second, they act with less force, than the trunks, from which they are derived." (See *Thomson on Inflammation, P.* 64.)

The first of these opinions, according to Dr. Thomson, was suggested by the views, which Stahl took of the animal œconomy, and his ideas respecting the tonic, or vital action of the capillary vessels. The doctrine however was more particularly insisted upon by his disciples and followers, especially, Dr. Gorter, who in one place expressly states; " that the proximate cause of inflammation consists in an increased vital action of some particular artery, or arteries, by which the blood is propelled with greater force, than usual, into the communicating lymphatic and colourless vessels." (See *his Compendium Medicinæ* and *Chirurgia Repurgata.*)

The opinion, which supposes the action of the inflamed vessels to be diminished, or to be proportionably less, than that of the trunk, or trunks, from which they are derived, was, as far as Dr. Thomson can learn, first stated by Vacca, an Italian physician, in a small treatise on inflammation, published at Florence in 1765, entitled, " *Liber de Inflammationis Morbosæ, quæ in humano corpore fit, naturâ, causis, effectibus, et curatione.*"

For an account of the arguments, with which Vacca supports his hypothesis, my limits oblige me to refer to the work of Dr. Thomson. (*P.* 68, *&c.*)

As this gentleman has observed, there are certain points, in which the two doctrines agree, as well as in which they differ.

" The advocates for each hypothesis agree in admitting, 1st, that inflammation has its seat in the capillary vessels; and 2ndly, that the redness in inflammation is owing to an unusual quantity of blood in the vessels of the inflamed part, and consequently that the capillary arteries are much dilated during the state of inflammation. The contractions of these vessels, indeed, it has been said, are increased also in a ratio proportional to the dilatations; but, this is an assertion, which has not yet been proved, either in the way of experiment, or of observation.

" The sense of throbbing, which the advocates for the hypothesis of increased capillary action regard as the strongest proof of that action, Mr. Allen is disposed to attribute to the difficulty, which the blood meets with in passing from the trunk into the capillary branches. This sensation of throbbing, and appearance of increased action, may be produced in an instant, by applying a ligature to an uninflamed finger, so as to obstruct the motion of the blood through its point. Besides, this throbbing, or pulsatory motion, can afford us no criterion, by which to judge of the force, with which the artery contracts, for, it is produced in the dilatation of the artery, and by a power foreign to the artery itself." (*Thomson on Inflammation, P.* 73.)

Attempts have been made to support the doctrine of the diminishe action of the inflamed vessels by an appeal to experiment. (See *Wilson's Treatise on Febrile Diseases.*) From the experiments, which Dr. Wilson made, in company with Mr. Boraston, he infers, that the circulation is slower in inflamed than in uninflamed arteries. " But, (says Dr. Thomson) the truth of this inference is not necessary to the establishment of Mr. Allen's hypothesis; and from

Does it arise from both. Some inflame. ~~[illegible]~~ by one cause, some others by [illegible]? Inquire

a number of experiments which I have at different times made upon frogs, I am inclined to believe, that a diminished velocity of the blood, in the capillary branches, is by no means a necessary, constant, nor even the most common effect of incipient and moderate degrees of inflammation." (*P.* 75.)

I shall quit this difficult part of the subject with advising the reader, who wishes to follow it up further, to peruse with attention the impartial observations and interesting experiments, which have been recently published in the work last quoted.

## SYMPTOMS OF PHLEGMONOUS INFLAMMATION FURTHER CONSIDERED.

The essential symptoms are redness, swelling, heat, and pain. As a modern author observes, the throbbing does not occur in every species of inflammation; and increased action of the vessels is rather inferred from other phenomena, than actually perceived. (See *Thomson's Lectures on Inflammation, P.* 42.)

*Redness.*—This is manifestly owing to the increased quantity of blood in the inflamed part. More blood must necessarily be contained there, because the vessels, which previously conveyed this fluid, are preternaturally distended, and the small vessels, which naturally contained only lymph, are now so enlarged as to be capable of receiving red blood. "I froze (says Mr. Hunter) the ear of a rabbit, and thawed it again; this occasioned a considerable inflammation, an increased heat, and thickening of the part. This rabbit was killed when the ear was in the height of inflammation, and the head being injected, the two ears were removed and dried. The uninflamed ear dried clear, and transparent, the vessels were distinctly seen ramifying through its substance; but, the inflamed ear dried thicker and more opaque, and its arteries were considerably larger."

Many have supposed, that the redness of common inflammation is partly occasioned by the generation of new vessels. This doctrine, however, seems very questionable. When coagulated lymph is extravasated upon the surface of a wound, an inflamed membrane, *&c.* I think no one can doubt, that the lymph often becomes vascular, in other words furnished with new vessels. But, in the extravasated lymph of a phlegmonous tumour, we have no evidence shewing that there is any generation of new vessels. Were the lymph to be rendered organized and vascular, the swelling and redness would probably be more permanent, and at least not admit so easily of resolution. When adhesions form between two inflamed surfaces, the organized substance forming the connexion, lives after the subsidence of the inflammation, and is a permanent effect. It was probably the enlargement of the small vessels, which led to the theory, that new vessels are formed in inflammation. It has, however, been justly observed, that the supposition easily admits of refutation; for heat, and many other causes of inflammation, operate so quickly, that there can be no time for the formation of any new vessels; and, yet the redness is as great, and the inflammation as perfect in a minute as in an hour or a day after the application of the exciting cause. (*Burns.*) Another reason assigned for the redness of inflammation, is that the blood after it has become venous, retains, more or less, its bright scarlet colour. (*Hunter.*)

*Swelling.*—This effect arises from several causes. 1. The increased quantity of blood in the vessels. 2. The effusion of coagulating lymph, and deposition of new matter. 3. The interruption of absorption, of late particularly noticed. (*Soemmering de Morb. Vas. Absorb.*)

*Pain.*—This is observed to be greatest during the diastole of the arteries. The affection is probably owing to the unnatural state of the nerves, and not to mere distention, as many have asserted. Were the latter cause a real one, the pain would always be proportioned to it.

"Parts, which in the sound state have little, or no sensibility (as Dr. Thomson remarks) become exquisitely sensible in the inflamed. That this is the case with tendon, ligament, cartilage, bone, and membrane, seems to be fully established by Dr. Whytt in the very instructive controversy carried on between him and Haller, respecting the sensibility and irritability of the different parts of man and other animals." (*Thomson's Lectures on Inflammation, P.* 45.)

*Heat.*—It was formerly imagined by many, (*Boerrhave, Sauvage, &c.*) who wrote after the discovery of the circulation of the blood, that the heat was produced by the attraction of the red globules, against the sides of the vessels. Modern philosophy, now, however, teaches us, that a fluid may flow, with the utmost velocity, through a pipe, for a thousand years, without producing a single degree of heat. Until lately it was the fashion to suppose, that the production of animal heat depended upon the difference in the capacity of arterial and venous blood for combining with caloric; and that in the minute arteries, the blood was combined with certain substances, in consequence of which its capacity for caloric was diminished, and heat given out. But, that when the venous blood had been freed from such substances in the lungs, its capacity was increased, and the heat, which was given out by the decomposition of the air which we inspire, was absorbed. The augmented heat of inflammation was conceived to arise from the

+ [illegible] from [illegible] lymph and [illegible] increased velocity of the circulation in the part affected. More blood was transmitted into the minute arteries; the capacity of a greater quantity of this fluid for heat was of course there necessarily diminished, and more caloric was extricated.

This fanciful doctrine, however, has at length been consigned to perpetual oblivion. The experiments of Mr. Brodie, in the Philosophical Transactions 1811, completely proved, that the production of animal heat could not depend upon the chemical changes made in the blood in its circulation, and that it ceased altogether after the brain had been separated from the body, notwithstanding respiration was artificially continued, and the usual chemical change went on in the lungs. It seems certain, therefore, that the nervous system has an essential influence over this most curious and interesting process.

The heat, or real increase of temperature in an inflamed part, when judged of by the thermometer, is generally much less, than might be supposed from the patient's sensations. It is said never to exceed the heat of the blood at the heart. This in health is usually about 100° Fahrenheit's thermometer; but, sometimes in diseases it rises to 106° or even 107°. Mr. Hunter artificially excited inflammation in the chest of a dog, and in the abdomen, rectum, and vagina of an ass, without being able to discover any obvious rise of temperature in these parts. In a patient however, on whom he operated for hydrocele, the thermometer, introduced into the tunica vaginalis, and kept for some time close to the side of the testicle, was only 92°; but, rose the following day, when inflammation had come on, to 98¾°.

### APPEARANCES OF THE BLOOD IN INFLAMMATION.

The blood, when taken out of the living vessels, spontaneously separates into two distinct parts, the serum and the crassamentum. The last is a compound substance, consisting chiefly of coagulating lymph, and red globules, the most heavy ingredients in the blood. Blood, taken away from persons affected with inflammation, is longer in coagulating, and coagulates more firmly, than in other instances. Hence, the red globules, not being so soon entangled in the lymph, descend, by their gravity, more deeply from its surface, which, being more or less divested of the red colouring matter, is from its appearance termed the *buffy coat*, or *inflammatory crust*. The firmer and more compact coagulation of the lymph compresses out an unusual quantity of serum from it, and the surface of the sizy blood is often formed into a hollow, the edges being drawn inward. (*Hunter.*) These changes in the blood are, in some cases, a more infallible proof of the existence of inflammation, than the state of the pulse itself. At the same time, it is probably only a criterion of some unusual operation going on in the system; for the blood taken from pregnant women is always found to exhibit the above appearances. In peritoneal inflammation, the patient sometimes seems to be in the most feeble state, and the pulse, abstractedly considered, would rather induce the practitioner to employ tonics and stimulants, than evacuations; but, should the continuance or exasperation of the disorder, or any other reason, lead the surgeon to use the lancet, then the *buffy coat*, and the *concave surface* of the blood, clear away all doubt concerning the existence of inflammation.

In a few anomalous constitutions, the blood, when drawn, always exhibits the above peculiarities.

### TERMINATIONS OF INFLAMMATION.

Inflammation is said to have three different terminations; or, in more correct language, we may say, that, after this process has continued a certain time, it either subsides entirely, induces a disposition in the vessels to form pus, or completely destroys the vitality of the part.

When the inflammation is to end in the first manner, which is the most favourable, the pain becomes less, the swelling subsides, the fever, and every other symptom, gradually abate, till at last the part is wholly restored to its natural size and colour. There is no formation of pus, nor any permanent injury of structure. This termination of inflammation is termed by surgeons *resolution*. It is fortunately the most common, as well as the most desirable manner, in which the affection ends.

If, however, notwithstanding the application of the usual remedies, the several symptoms of heat, pain, and redness, instead of diminishing, rather increase; if the febrile symptoms are likewise augmented, and the tumour gradually acquires a larger size, turns soft, somewhat prominent in the middle, or towards its most depending part; if it should next acquire a clear shining appearance, and become less painful, the different symptoms of fever being at the same time diminished, and a fluctuation perceptible in the tumour; the inflammation has ended in *suppuration*.

The worst, but happily, the least frequent consequence of common inflammation, is the death, or *mortification*, of the part affected. The signs of this disastrous event are a change of colour in the part, which, from being of a bright red, becomes of a livid hue; small vesicles, filled with a thin fetid serum, arise on its surface, and air is plainly felt to exist in the disortered situation. The pain is indeed diminished; but the pulse sinks, while the tumour is gradually changed into a black, fibrous mass.

These are the three common terminations of inflammation. In books, scirrhus is sometimes enumerated as one of the terminations of inflammation. The best modern surgeons, however, do not regard scirrhus as one of the usual effects of ordinary inflammation. As a late writer observes; "the term scirrhus, as used by the older medical writers, is extremely indefinite, having been sometimes used to express every kind of induration, which remained after an attack of inflammation, as well as the morbid incipient state of parts about to become affected with cancer. Surgeons now usually limit the use of the term to the last of these significations." (*Thomson on Inflammation, P.* 126.)

Common inflammation, particularly when it affects glandular parts, is often observed to leave an induration in the part. We know very well, that, when the testis has been inflamed, a hardness of the epididymis frequently remains afterwards during life. Such indurations, however, are not at all malignant, and, consequently are very different in their nature, from what is implied by a real scirrhus.

## TREATMENT OF INFLAMMATION.

### *Removal of the Exciting, or Remote Cause.*

Although from what has been previously said, doubts may rationally be entertained, concerning the accuracy of the doctrine, which ascribes the proximate cause of inflammation wholly and entirely to an increased action of the arteries of the part affected, we must I believe admit, that such increased action constantly attends phlegmonous inflammation, and that, in the treatment, the diminution of it is one of the most useful objects, to which we can direct our endeavours.

The means employed for the relief of inflammation, have been cursorily noticed in a preceding article. (See *Antiphlogistics.*) We shall now devote a few pages to a more particular consideration of them.

The first circumstance to be attended to in all cases, in which resolution is to be attempted, is the removal of all such exciting causes of the disorder as may happen to present themselves. If the irritation of a splinter were to excite phlegmonous inflammation, who would not of his own accord directly take away the extraneous body?

Foreign substances in wounds frequently excite inflammation, and ought to be taken away as speedily as possible; splintered pieces of bone often give rise to the affection, and require removal; the head of a bone, being out of its place, may press and inflame the part on which it lies; and who does not immediately see the propriety of putting it back into its natural situation? These and other similar exciting causes may oftentimes be detected and removed at once, and this is doing a great deal towards the cure of the inflammation. Many of the exciting causes of this affection are only of momentary application; yet, though they no longer exist, the process of inflammation must follow the violence and irritation, which were suddenly produced, and still remain. Hence, besides taking away, if possible, the remote cause, it is proper to moderate, by other means, the increased action of the vessels.

### *Bleeding.*

Without altogether believing, that inflammation depends upon an increased action of the vessels, we consider the fact sufficiently proved, that a greater quantity of blood is impelled into, and circulates through the inflamed part, than in the natural state. Hence, bleeding must be a principal means of relieving inflammation; because it lessens the action of the whole arterial system, and, of course, of that part, which is undergoing inflammation; and because it diminishes the quantity of blood transmitted to the part affected, by lessening the whole mass in the circulation.

Bleeding, however, is often misemployed, especially, when regarded as the only remedy for inflammation, and other steps are neglected. The obstinacy and vehemence of the process in weak constitutions prove, that bleeding is not invariably proper. When inflammation is complicated with an unhealthy state of the alimentary canal, blood should be taken away with great circumspection.

A great deal of induration, with little pain and heat in the inflamed part; the probability of a long and copious suppuration, as is the case in many compound fractures; and the dependence of the inflammation on local weakness; are particular instances, in which the practitioner should be sparing of this evacuation. Bleeding is quite unnecessary when the local inflammation and symptomatic fever are trivial, when the patient is feeble or very old, and when the cause of the affection can be entirely removed. (*Richter.*)

On the other hand bleeding is highly beneficial in all cases, in which the inflammation is uncomplicated with a morbid state of the gastric system, is considerable in extent and degree, and attended with a good deal of febrile disturbance. The same is also strongly indicated, when the part affected is very sensible, and highly important, in regard to its office in the system. Hence, ophthalmy, or inflammation of the eye, which is a most sensible part, particularly requires a free evacuation of blood. Hence, inflammation of the lungs, brain, or stomach, which are organs, the sound state of which is intimately essential to the regular continuance of all the various operations in the animal machine, particularly demands the employment of the lancet; for, if a successful effort be not promptly made to stop such inflammation, death itself will, in all probability, be the result.

Bleeding is likewise indicated, when the patient is young, robust, and plethoric; when the cause of the disorder can neither be removed nor diminished, and when there is a very strong motive for wishing to avoid the formation of matter. Inflammation of the eye affords an instance illustrative of the truth of the last observation; for, if suppuration be allowed to take place in this organ, the common consequence is so serious a destruction of its internal structure and organization, that the future restoration of sight is totally impossible. Under the circumstances, which we have specified, it is frequently necessary to repeat bleeding several times.

The efficacy of bleeding is greater, the sooner it is practised, and the more suddenly the blood is evacuated. Bleeding near the part affected is usually more effectual, than when done in a remote situation. Hence, in inflammation of the eye or brain, it is deemed most advantageous to take blood from the temporal artery.

"In many inflammations, particularly those of the parts contained in the three great cavities of the head, chest, and belly, general bloodletting (says a judicious writer) if not the only, is the principal remedy, to which we can trust for a cure. The quantity of blood, which in these inflammations it is necessary to take away, varies according to the violence of the inflammation, the temperament, strength, and habits of the patient, and according to the structure, functions, and situation of the organ in which it occurs. From twelve to twenty ounces, or even more, ought generally to be drawn every time we have occasion to use the lancet in the cure of inflammation, and bleeding to this extent may be repeated two or three times in the course of the first twenty-four hours, according to the effects which it seems to produce, as well as according to the violence and urgency of the symptoms. In inflammation of internal parts, we judge of the effect of bleeding, and of the necessity of a repetition, from the feeling and continuance of pain, from the state of the pulse, and also from the appearance of the blood, which has been last drawn.

"A partial, and in some instances, an almost complete cessation of pain takes place even during the operation of bloodletting. This is always a favorable symptom, and indicates, that the inflammation has made no great, or very alarming progress. In other instances, the relief from pain, though inconsiderable, at the time of bleeding, becomes afterwards more sensible, and the other symptoms of inflammation abate in nearly the same proportion; while, in other instances again, the pain is either not relieved by the bleeding, or, if relieved, the relief is but of short duration. These last are cases, in which, the other symptoms of inflammation continuing unabated, recourse must be had again to the use of the lancet, and as much blood drawn, as can be done with safety to the patient.

"The changes, which take place in the state of the pulse, either with regard to its frequency, or strength, during, or soon after the abstraction of blood, though they afford criteria, by which we may judge of the state of the inflammation, and of the effects of the bleeding, are by no means marks so sure of the advantage, which has been obtained, as that derived from the cessation of pain.

"In some inflammations of the head, for example, the pulse is slower, than natural, though it beats with its accustomed, or even with an increased degree of strength. In inflammations also of the peritoneum, and of the intestinal canal, we find the pulse not much quicker, than natural, small, and contracted. We should deceive ourselves, therefore, were we to infer, that an increase of inflammation had taken place, because, in the first instance, the pulse had become quicker, and, in the second, fuller, and stronger, during, or soon after the abstraction of a quantity of blood.

"The pulse, it may be remarked, has often a contracted, cord-like feel in inflammation, and it may always be regarded as a favourable event, when it becomes softer, fuller, and slower, during, or soon after bloodletting." (See *Thomson's Lectures on Inflammation*, P. 166-168.)

With respect to the buffy coat of the blood, Dr. Thomson states, that it is not by the buffy coat alone, but by the buffy coat, in conjunction with the quantity and firmness of the coagulum, that we must judge of the propriety of any further detraction. When the buffy coat has a firm and tenacious consistence, and when the pain continues unabated, we may conclude the inflammation has not been subdued. But, when the coagulum is soft and easily broken, and when the color of the buffy coat is changed from a yellowish to a greenish hue, Dr. Thomson thinks, that little or no benefit can be derived from bleeding.

Every practitioner should also remember, that, in particular constitutions, and in pregnancy, the blood taken away naturally exhibits a buffy appearance, independently of inflammation

The preceding remarks chiefly relate to *general* bleeding; for, in phlegmonous inflammation, *topical* bleeding is scarcely ever improper. It is always a point highly worthy of the surgeon's consideration, whether bleeding *in* or *near* the part will answer better, than taking the blood from the *general habit*; for, certainly less may be removed in this way, so as to have equal effect upon the part inflamed, and, probably, upon every other disease that is relieved by bleeding, and yet affect the constitution less. Although, in many cases, the general habit may be relieved by bleeding, yet the part affected will always require this evacuation most. That local bleeding has very considerable effects on the inflamed part, is proved by the sudden relief, which leeches, applied in cases of gout, produce. Bleeding by leeches alone will also remove a tumour in the breast, having all the appearances of a scirrhus, which cannot be considered as inflammatory, so that topical bleeding extends its power further than the mere checking of inflammation. Some part of its effect has been imputed to sympathy. (*Hunter.*) There are three modes of performing topical bleeding; by cupping; by leeches; and by dividing, or scarifying the dilated vessels leading to the inflamed part. Upon the head and face, leeches are commonly employed; upon the chest, either leeches or cupping; upon the abdomen, leeches; and upon the joints, either cupping or leeches. When the eye is inflamed, leeches may either be applied to the adjoining temple; or the dilated vessels of the conjunctiva may be scarified; or both methods may be adopted. When the inflammation extends quite to the surface of the body, leeches are always most eligible, as their bite causes less irritation in inflamed parts, than the punctures of the scarificator, or the pressure of the cupping glasses.

### *Purging.*

The exhibition of mild laxative medicines, and saline purgatives, is a principal means of diminishing inflammation. Purging does not produce such lasting weakness as is the consequence of bleeding, and, therefore, it is scarcely ever omitted, even when taking away blood is deemed improper. Saline purges must lessen the quantity of circulating blood, inasmuch as they increase the secretion from the intestinal arteries. Hence, they must operate beneficially in the cure of local inflammation, much upon the same principle as bleeding does. Mr. Hunter was of opinion that purging lowers action, without diminishing strength, by which we are probably to understand, without producing a very lasting or permanent loss of strengh. With respect to mild laxative medicines, none are superior to manna, rhubarb, oleum ricini, and the like; and of the saline purgatives, which are in general preferable to the former ones, the sulphate of soda, tartrite of potass, phosphate of soda, and sulphate of magnesia, are the best. We may here remark, that besides the benefit, which the local inflammation derives from the judicious administration of purgatives, the costiveness and heat, which usually attend the symptomatic fever, are also relieved by the same means.

"Purgatives (says Dr. Thomson) are more or less required in almost every species of inflammation; but, they are more peculiarly necessary in those, which are accompanied with a high degree of fever, or with derangements of the digestive, or biliary organs. In cases of inflammation, which have a tendency to spontaneous resolution, they are almost always the best, and often the only remedies that are required." (*Lectures on Inflammation, P.* 171.)

Considering the general approbation of the employment of mild saline purgatives in cases of inflammation, I confess, I was not a little surprised to find merely the following short unfavourable notice taken of them by a celebrated foreign professor, in his account of the treatment of inflammation. "As for purgatives, they must be used with discretion. There are none of them antiphlogistic, as has been pretended. They always produce more or less irritation, and can only be applicable, when the cause of the inflammation is in the intestinal canal. In the beginning of the complaint, we ought therefore in general to abstain from them, and confine ourselves to emollient clysters." (See *Boyer's Traité des Maladies Chirurgicales, T.* 1, *P.* 39.)

### *Diaphoretic and Nauseating Medicines.*

Medicines, which have the power of producing sickness, lessen, for a time, the action, and even the general powers of life. This is in consequence of every part of the body sympathizing with the stomach; and the effect may be very quickly excited. Sickness lowers the pulse, makes the small vessels contract, and rather disposes the skin for perspiration. But nothing more than nausea should be caused: for vomiting rather rouses than depresses. (*Hunter.*) Nauseating medicines, employed after bleeding has been practised once or twice, are often productive of considerable benefit; but there are some affections, in which they cannot be used, such as inflammation of the stomach and intestines. In all superficial inflammations, however, they may be safely and advantageously exhibited, as well as in most inflammatory affections internally situated. In inflammation of the dura mater and brain, and, indeed, in every instance, in which there is an urgent reason for putting as sudden a check as possible to the continuance of the affection, the employment of nauseating doses of antimony is most strongly indicated. The tartrite of antimony, (emetic tartar) is the one, on which practitioners place the greatest reliance, and it is to be prescribed for the purpose of exciting nausea, as directed below.*

The safest diaphoretics are the citrate of potass, the acetate of ammonia, and the tartrite of antimony, and James's powder. The two latter, from their effects in producing nausea, and weakening the pulse, are sometimes most efficacious, as already stated.

"The warm bath seems to act (as a modern writer says) not only by increasing the tendency to perspiration, but also by occasioning a determination of blood to those parts of the body to which it is more immediately applied. It is in this way that bathing the feet seems to relieve inflammatory affections of the head and throat. I have not seen any experiments, nor am I acquainted with any, which have been made with a view to ascertain its use in the inflammations of the chest; but, in all inflammations of the belly, and of the viscera contained within that cavity, there are no other means of cure, bloodletting excepted, which afford such sudden and permanent relief, as that which is obtained from hot fomentations and warm bathing." (See *Thomson's Lectures on Inflammation, P.* 173.)

### *Opium.*

The majority of surgeons entertain an insuperable objection to the administration of opiates in almost all cases of inflammation, and the aversion to this practice is for the most part deducible from the recollection of opium being a powerful stimulant. The plan, however, has its advocates. (*B. Bell; Richter, &c.*) One of its strongest partisans tells us, that opium particularly lessens the disturbance of inflammation, and allays pain, which is at once a principal symptom of the process, and a cause of its augmentation, as well as that of the fever. Opium also quiets the inordinate action of the solids, the mental agitation, and restlessness so powerfully, that it well deserves the name of the grand *antiphlogistic remedy.* It likewise occasions a moisture on the surface of the body, which experience shews is eminently serviceable in all inflammations affecting the skin. When given with this view, it is usually conjoined with antimony, camphor, calomel, or ipecacuanha. The administration of opium is a general practice in all painful inflammations arising from external causes, and it is attended with perfect safety when evacuations from the bowels and bleeding have been previously put in practice. Care must only be taken to give it in sufficient doses; for small quantities not only fail in fulfilling the object, but frequently produce quite an opposite effect. During its employment, the bowels should be kept open by glysters. The efficacy of opium chiefly manifests itself in the early stage of the affection; for, as soon as the inflammatory fever has extended itself to the whole system, it loses its beneficial virtues. Hence, in cases of external injuries, it is to be given the two first days, immediately after bleeding. It is to be given as soon after the accident as posssible in order to tranquillize the mental alarm, and, if convenient, towards the evening, for the sake of procuring for the patient a quiet night. (*Richter.*) Evacuations being premised, says the other advocate for this medicine, the next object of importance is to procure ease and quietness to the patient, which, in cases of inflammation, are often of more real service, than any other circumstance whatever. The most effectual remedy for this purpose is opium, which, when the pain and irritations are considerable, as very frequently happens in extensive inflammations, should never be omitted. In large wounds, especially after amputations, and other capital operations, and in punctures of all kinds, large doses of opium are always attended with remarkably good effects. In all such cases, however, opium, in order to have a proper influence, should be administered in very large doses; otherwise, instead of proving serviceable, it seems rather to have the contrary effect. This circumstance, is, perhaps, the chief reason why opiates in general have been very unjustly condemned in every case of inflammation. (*B. Bell.*)

On the contrary, those who are averse to the use of opium, remark, that in acute inflammation, daily experience shews, independently of every theory, that the exhibition of this medicine increases the general fever, and aggravates the local action Even given as a preventive of inflammation, after operations, anodynes are almost uniformly hurtful, producing restlessness, heat, thirst, and afterwards head-ach, sickness, and frequently, troublesome vomiting. (*Burns.*)

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* ℞. Antimonii tartarisati grana duo; Aquæ distillatæ uncias quatuor. Misce et cola. Dosis, Uncia dimidia sextâ quâque horâ.

According to Dr. Thomson, "those diaphoretics, into the composition of which opium enters, seem to be better adapted for inflammation attended with fever of a typhoid character, or for cases, where the inflammation has existed for a considerable time before diaphoretics are employed. Given at an early period in acute inflammatory diseases, opium never fails to excite vascular action, and to aggravate all the symptoms of fever. Opium, therefore, is not to be used, unless to allay the pain and irritation from a surgical operation, or from the recent infliction of an external injury. Indeed, unless when the patient is very nervous, and complains much of pain, its use, even after chirurgical operations, had, I believe, in general, better be abstained from, as it almost never fails to add to the violence of the symptomatic fever, which is the necessary consequence of the operation. Its effects are often very beneficial, when the period of this fever has passed over." (See *Lectures on Inflammation, P.* 172.)

Upon the whole, candour obliges me to own, that the votes of the majority of surgeons in this country are decidedly against the general use of opium in inflammation; but, after the performance of severe operations, and in all instances, attended with excessive pain, truth, I believe, will justify my saying, that the voice of most practitioners is in favour of the exhibition of this remedy.

### DIET AND REGIMEN.

In all cases, the surgeon is to forbid the use of wine and spirits; and, when the inflammation is at all considerable, the same prohibition is to be made in regard to animal food. Watery, cooling, mucilaginous drinks are proper; for they keep off thirst and heat, promote perspiration, and tend to sooth the increased action of the whole arterial system. For this purpose, whey, butter-milk, barley-water, decoction of dried fruits, water-gruel, &c. may be given.

When diluent drinks "are intended to allay thirst, as well as to promote perspiration, the addition of some vegetable acid, such as lemon-juice, or cream of tartar, renders them in general very palatable to patients. In the earlier stages of inflammation, and where the object is to induce a moisture on the skin, the mineral acids, though they might serve to quench thirst, are not to be employed, as they tend rather to check, than promote the flow of sweat." (*Thomson on Inflammation, P.* 172.)

The chamber, in which the patient lies, should not be kept warmer than his comfort requires; for heat tends powerfully to keep up an increased action of the whole sanguiferous system. For the same reason, the patient should not be covered with a superfluous quantity of bed-clothes.

The whole body, but more especially the inflamed part, should be preserved as free as possible from every kind of motion. Every one knows, that all motion, exercise, and muscular exertion accelerate the circulation, and, hence, must have a pernicious effect on inflammation, by determining a larger quantity of blood to the part affected.

### TOPICAL APPLICATIONS—COLD ONES.

With the exception of what has been stated, concerning topical bleeding, all the foregoing remarks relate to the *general* treatment of inflammation: we shall next consider the *local*

It has been already observed, that phlegmon is attended with an increase of heat in the part affected, and it is an acknowledged and well known fact, that the action of the arteries, as well as every other operation in the animal economy, is promoted and increased by the influence of heat. For this reason an obvious indication arises, viz. to reduce the temperature of the inflamed part, by the topical application of cold, and, in particular, by continually abstracting the heat generated in the part, by keeping up a constant evaporation from its surface.

"Of the local remedies, applied directly to inflamed parts, (says Dr. Thomson) cold is undoubtedly one of the most powerful. In reducing the temperature, cold diminishes the morbid sensibility and pain of inflamed parts; and, probably, in consequence of this, the action also of the vessels, by which the inflamed parts are supplied with blood. The most common mode of employing cold is by the application to the part inflamed of cloths, which have been dipt in cold water. These are to be repeated as often as they become warm, or any relief is experienced by the patient from their use. When the inflammation is seated on the remote parts of either the upper or lower extremities of the body, the inflamed part itself may be immersed in water. This immersion, as I shall afterwards have occasion to mention, has often been found useful in superficial burns. In order to increase the effect produced by cold, it has been proposed to reduce the temperature of the water below that of the surrounding atmosphere, by a proper mixture of saline bodies, as some of these are known to produce cold during their solution in water, or even in very urgent cases to apply ice or snow. The ice, however, must not be applied too long, nor in too large a quantity; for, it very quickly reduces the temperature of the part to which it is applied, and, in some instances, has been known to occasion gangrene, &c." (*On Inflammation*, p. 180.)

With the cold water applied to phlegmonous inflammation, it is usual to blend some remedies, which are astringent, and supposed to have also a sedative quality. The acetite of lead, sulphate of zinc, and vinegar, seem now, indeed, to have acquired permanent celebrity for their efficacy in resolving inflammation.

Extensive experience, and long established trials, have now fully confirmed the virtue of all those local remedies, in which the acetite of lead is the active ingredient. M. Goulard, and numerous other French surgeons, found, that the objections to the employment of many other sedative applications in the treatment of inflammation, did not exist against the use of this preparation of lead. The universal assent of modern practitioners proves, indeed, that the acetite of lead, as a local application for genuine phlegmonous inflammation, is certainly unsurpassed, if not unrivalled, in point of efficacy.

The preparations of lead are recommended by M. Goulard, as almost equally applicable to every stage of inflammation. When swellings have fully suppurated, the employment of, what he calls, the *extractum Saturni*, will almost always render it unnecessary to open them. Even in gangrene, the solution of lead is represented by this zealous writer, as a remedy deserving of the greatest confidence.

But, notwithstanding the above exaggeration, every man of experience and observation will allow, that, while there is a chance of accomplishing resolution, no local applications to phlegmonous inflammation, are in general so proper, as cold lotions, containing the acetite of lead.

"The manner in which it operates in curing inflammation, (as Dr. Thomson observes) is not known to us, nor is it at all times easy to distinguish between the share, which the lead has in allaying inflammation, and that which is to be attributed to the coldness of the water in which it is dissolved. No one, however, will doubt of the efficacy of this remedy, who has ever felt it in his own body, or witnessed in others the soothing and agreeable effects, which it produces in excoriations of the skin, or in inflammation of mucous membranes. Lead is a remedy, which is often highly useful in excoriations from friction, in punctured wounds with inflammation of absorbent vessels, veins, nerves, &c. in slight burns, in cutaneous heat, eruptions of the face, in fractures and dislocations, in the inflammation attending scirrhus and cancer, syphilis and gonorrhea, in wounds accompanied with excoriation from the discharges they emit, and in wounds attended with a burning sensation of pain." (*P.* 182.)

From the poisonous qualities of lead, when taken into the system, and from the possibility of this mineral being absorbed from the surface of the body, objections have arisen against the free use of its preparations, even as outward remedies in cases of inflammation. Certain it is, however, that though the possibility of such absorption is proved by the occurrence of the disorder called the *colica pictonum*, which originates in painters from the white lead absorbed into the system, yet, any ill effects from the use of lead, as an application to inflamed parts, are so exceedingly rare, that they can hardly form a serious objection to the practice. It is a fact, that, in inflamed parts, there is an impediment to absorption, and this circumstance may tend to render the employment of lead a matter of safety. Mr. B. Bell observes, that in all the experience he has had, of the external application of lead and its preparations, and in many cases, particularly of burns, he has known the greatest part of the surface of the body covered with them for days, nay, for weeks together, he does not recollect a single instance of any disagreeable symptom being ever produced by them. Nor has Dr. Thomson ever seen the colica pictonum follow the use of Goulard. (See *Lectures on Inflammation*, p. 183.)

A lotion composed of acetite of lead, vinegar, and water, is one very commonly employed*. Occasionally, bread-crumb is moistened in the fluid, and applied to the part affected, in the form of a poultice; but, linen wet in the lotion, and kept constantly so, is now almost always preferred. Thus a continual evaporation is maintained, and of course a continual abstraction of heat.

The liquor plumbi acetatis is preferred by most surgeons.

About a tea-spoonful of this preparation, mixed with a pint of water, makes a very proper lotion for all ordinary cases.

When the surgeon is afraid to employ a solution of lead, he may try one containing the sulphate of zinc. One dram is to be dissolved in a pint of water, and linen, well wet with the lotion, is to be applied to the inflamed part.

Many practitioners impute very little real efficacy either to the acetite of lead, or sulphate of zinc, contained in the above applications: and they attribute all the good, that is produced, entirely to the evaporation kept up from the surface of the inflamed part, and to the coldness of the fluid, in which the metallic salts are dissolved. Surgeons, who entertain these sentiments, think the application of cold water alone quite as efficacious, as that of any medicated lotion whatsoever.

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* ℞. Cerussæ Acetatæ ℥ss.
Solve in Acet. pur. ℥iv.
Et adde Aq. Fontanæ distill.
℔ij.

The vinegar makes the solution more complete.

There are particular cases of inflammation, in which the extravasation of blood and lymph, into the interstices of the inflamed part, is exceedingly copious, while the swelling is considerable, and the pain and redness not particularly great. In such instances, it is a grand indication to rouse the action of the absorbents, in order to remove the extravasated fluid, and with this view, a more powerful discutient lotion, than the saturnine one, should be employed. Sometimes, it is better to use embrocations and liniments, than any sort of lotion. A very excellent discutient lotion is one of those mentioned below.*

When the part affected with inflammation is not very tender, or when it lies deep, applications of the vegetable acid are often had recourse to with considerable advantage; and the most effectual form of using it seems to be a poultice made with vinegar and crumb of bread. In such cases, it has been thought, that an alternate use of this remedy, and the saturnine lotion, has produced more beneficial effects, than are commonly observed from a continued use of one of them. (*B. Bell.*) However, surgeons of the present day seem to think, that vinegar can be as advantageously applied in the form of a lotion, as in that of a poultice, and, certainly, with less trouble.

Alcohol and æther have acquired some celebrity, as local remedies for inflammation. Perhaps, one great reason, why they are not more extensively used in this way is the expence attending such treatment, as these fluids evaporate with great rapidity. Alcohol may possibly prove useful from its astringent qualities; but, it seems much more rational to impute both its virtue, and that of æther, to the powerful manner, in which the evaporation of such fluids deprives the inflamed part of its heat.

### WARM APPLICATIONS, EMOLLIENT POULTICES AND FOMENTATIONS.

The absurdity of attempting to reconcile every useful practice with a philosophical theory, is, in no instance, more strikingly shewn, than in the opposite sorts of local applications, which are of service in inflammation. The generality of cases undoubtedly receive most relief from the use of cold sedative astringent lotions: but, there are constitutions and parts, which derive most service from the local employment of warm emollient remedies.

Were I to endeavour to define the particular instances, in which the latter applications avail most, I should take upon me a task, which has baffled all the most able surgical writers. The first stage of the acute ophthalmy, and the hernia humoralis, or inflamed testicle, may be specified, however, as examples, in which, generally speaking, warm emollient applications are better, than cold astringent ones. "Fomentations, or embrocations with warm water, (as a judicious writer has remarked) are often a very powerful means of abating internal inflammation. This effect is very apparent in some of the deeper seated inflammations, as in the inflammation of the urinary bladder, intestines, or other viscera contained within the cavity of the abdomen. The warmth, in this case, may be applied to the surface of the abdomen, by bath, or fomentation, or, in the way of injection, by the anus; &c. In some inflammations of the joints, warmth also is found to be very useful. These, however, are inflammations, which have a tendency to the chronic state." (See *Thomson's Lectures on Inflammation, p.* 188.)

If we may judge by the feelings of certain patients, there are undoubtedly particular constitutions, in which the local use of warm remedies produces greater relief than that of cold ones. This circumstance, however, does not generally happen; and, as warm emollient applications, of all kinds, have the most powerful influence in promoting suppuration, a fact admitted by every experienced practitioner, the use of such remedies, while the resolution of inflammation is practicable, must be highly censurable. But, I am ready to grant, that in all cases of inflammation, which manifestly cannot be cured without suppuration, the emollient plan of treatment ought to be at once adopted; for, the sooner the matter is formed, the sooner the inflammation itself is stopped. The inflammation attending contused and gun-shot wounds, and that accompanying boils and carbuncles, are of this description. The inflammation, originating in fevers, commonly ends in suppuration, and, perhaps, it might be advantageous, in such instances, also, to employ at once the emollient treatment.

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* ℞. Ammoniæ Muriatæ ℥ss.
Aceti;
Spiritûs Vini rectificati; sing. ℔j.
M.
℞. Aq. Ammon. Acet.
Spir. Vini rectif.;
Aq. Distillatæ; sing. ℥iv. M.
The Aqua Ammoniæ Acet. alone also does very well.

Warmth and moisture together, in other words, fomentations, are commonly had recourse to in cases of inflammation; but, when the warmth is as much as the sensitive principle can bear, it excites action. Whether it is the action of inflammation, or the action of the contraction of the vessels, is unknown. We see that many patients cannot bear warmth, and, therefore, it might be supposed to increase the action of dilatation, and do harm. But, if the pain should arise from the contraction of the inflamed vessels, benefit would be the result; though we must doubt that this change is produced, as making the vessels contract would probably give ease. (*Hunter.*)

From the preceding observations, we must perceive how vain it is to theorize on this subject, which even puzzled the genius and penetration of a Hunter. In addition to what has been already observed, I feel totally incapable of giving any useful practical advice, with respect to those cases, in which warm emollient applications should be used in preference to cold astringent ones. I can, however, with confidence remark, that the surgeon, who consults the feelings and comfort of the patient on this point, will seldom commit any serious error. Hence, in all cases, in which the first kind of topical applications seem not to produce the wonted degree of relief, let the second sort be tried. From the opportunity of comparison, a right judgment may then be easily formed.

The poultice made of the powder of linseed is so easily prepared, that the old bread and milk poultice is now seldom made. As much hot water is to be put into a basin, as the size of the poultice requires, and then the linseed powder is to be gradually mixed with the water, till the mass is of a proper consistence. Very frequently, a little sweet oil is also added to keep the application longer soft and moist.

Fomentations are only to be considered as temporary applications, while the emollient poultices are the permanent ones. The former are, at most, never used more than three times a day, for the space of about half an hour each time. Two of the best are directed below.*

Some practitioners, however, are inclined to think warm water alone quite as efficacious as the decoctions of particular herbs. Thus Dr. Thomson observes, "herbs are now seldom used in the way of fomentation, unless in compliance with ancient custom, or with the prejudices of particular individuals. The discutient power of the warm water may be increased by the addition of various substances, such as vinegar, spirits of wine; saline substances, such as common salt, acetite and muriate of ammonia. But, these warm and stimulating embrocations are used chiefly in the passive, chronic, or more indolent species of inflammation." (See *Lectures on Inflammation*, p. 189.)

By pursuing the treatment, recommended above, the resolution of the inflammation will in general begin to take place, either in the course of three or four days, or in a shorter space of time. At all events, it may usually be known before the expiration of this period, how the disorder will terminate. If the heat, pain, and other attending symptoms abate; and, especially, if the tumour begins to decrease, without the occurrence of any gangrenous appearances; we may then be almost certain, that, by a continuance of the same plan, a total resolution will in time be effected.

On the other hand, when all the different symptoms increase, and, particularly when the tumor becomes larger, and softish, attended with a more violent throbbing pain, we may conclude, that the case will proceed to suppuration. Hence, an immediate change of treatment is indicated, and such applications, as were proper, while resolution seemed practicable, are to be left off, and others substituted. This remark relates to the employment of cold astringent remedies, which, when suppuration is inevitable, only do harm, by retarding what cannot be avoided, and affording no relief of the pain and other symptoms. If the inflammation, however, should already be treated with emollients, no alteration of the topical applications is requisite, in consequence of the inevitability of the formation of matter. Indeed emollient poultices, and fomentations, are the chief local means both of promoting suppuration, and diminishing the pain, violent throbbing, &c. which always precede this termination of phlegmonous inflammation.

But, besides the substitution of warm emollient applications for cold astringent lotions, practitioners have decided, that it is also prudent, as soon as the certainty is manifest, to relinquish the free employment of evacuations, particularly, blood-letting, and to allow the patient a more generous diet. When the system is too much reduced by the injudicious continuance of the rigorous antiphlogistic treatment, the progress of the ensuing suppuration is always retarded in a disadvantageous manner, and the patient is rendered too weak to support, either a long continued, or a profuse discharge, which, it may not be possible to avoid.

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* ℞. Lini contusi ℥j.
Chamæmeli ℥ij.
Aq. Distill. ℔vj. Paulisper coque et cola.
or ℞ Papaveris albi exsiccati ℥iv.
Aq. Puræ ℔vj. Coque usque remaneant ℔ij. et cola.

We shall conclude this article with briefly noticing blisters, rubefacients, issues, and synapisms, as means often employed for the relief of particular cases of inflammation. "Blisters, (says Dr. Thomson,) are never applied to a part which is actually inflamed. They seem to be chiefly useful by exciting inflammation in a contiguous part. It is from this tendency, which blisters have to produce inflammation, and of course a certain degree of fever, that they are seldom to be employed in acute inflammatory fevers, till the constitutional symptoms are by other means in some measure subdued." (*P.* 187.)

"Of the same nature, though milder in their operation, than blisters, are the whole class of rubefacients. They produce a determination of blood to the parts to which they are applied, and in a manner not yet well understood, occasion a diminution in the action of the vessels, and consequently in the quantity of blood with which the inflamed parts are supplied. This influence is exerted more or less directly in different instances. The extremities of the intercostal arteries may open both on the pleura lining the chest and on the surface of the skin covering it, and whatever excites an increased flow of blood into one of these textures, may be conceived to be attended with a proportionally diminished flow into the other texture. But, blisters are found by experience to be efficacious in removing inflammation, where no communication whatever can be traced between the blood-vessels of the inflamed part, and that to which the blister is applied. We have examples of this mode of action in the beneficial effects obtained from the application of blisters in inflammation of the brain and the membranes immediately covering it, of the lungs and intestines, or of any of the viscera contained in the cavity of the abdomen. The nearer in such instances the blister or rubefacient can be applied to the part inflamed, the greater is the relief obtained; and, in general, I believe, it may be laid down as a rule, that the relief, which they afford, will be proportional to the degree of inflammation, which they excite." (See *Thomson's Lectures on Inflammation*, *p.* 187-189.)

Synapisms, blisters, and issues are in many instances applied to situations, which are so remote from and unconnected by vessels with the inflamed parts, that it is impossible to explain their mode of operation except through the medium of the nervous system. "The irritation of a synapism applied to the foot (says Dr. Thomson) may relieve from an attack of gout in the head, or stomach. Bathing the feet and legs gives relief in inflammation of the bowels; and the application of a blister, or caustic to the neck, may cure an inflammation of the eyes, &c." (*P.* 189.) Here counter-irritation is the principle, by which an explanation is usually attempted. (See *Blisters.*)

On the subject of inflammation, the best works for perusal are; *Van Swieten's Commentaries on Boerhaave; Gorter's Compendium Medicinæ, and his Chirurgia Repurgata. Vacca Liber de Inflammationis morbosæ, quæ in humano corpore fit, naturâ, causis, effectibus, et curatione,* 1765. *Cullen's First Lines of the Practice of Physic, Vol.* 1.; *John Hunter on the Blood, Inflammation, &c.*; *Burns's Dissertations on the same. Thomson's Lectures on Inflammation,* *Edinb.* 1813. *Boyer, Traité des Maladies Chirurgicales, T.* 1. *Delpech, Précis Elémentaire des Maladies Reputées Chirurgicales, Tom.* 1. *Chap.* 1. *Paris* 1816.

**INGUINAL HERNIA.** See *Hernia.*

**INJECTION.** A fluid intended to be thrown into a part of the body by means of a syringe. Thus port wine and water form an injection, which is used by surgeons for radically curing the hydrocele, and, for this purpose, it is introduced into the cavity of the tunica vaginalis, where it excites the degree of inflammation necessary to produce an universal adhesion between this membrane and the albuginea.

Thus many fluid remedies are introduced into the urethra and vagina for curing the gonorrhœa. In the article *Gonorrhœa*, will be found an account of the best injections employed for its relief. We here subjoin a few additional remedies of this class.

**INJECTIO ACIDI MURIATICI.**—℞ Aquæ distil. ℥iv. Acid. Mur. gutt. viij. Misce.—Useful when the scalding is a very troublesome symptom.

**INJECTIO ALUMINIS.**—℞. Alum ʒj. Aq. pur. ℥vj. Misce.—Successfully employed by Dr. Cheston, as an injection in affections of the rectum, either when the internal coat is simply relaxed, and disposed to prolapsus, or when it is studded with loose fungated tumours. In such cases, camphor is also of service. The quantity of alum may be increased, if the parts will bear it.

**INJECTIO CUPRI AMMONIATI.**—℞. Liquoris Cupri ammon. gutt. xx. Aquæ roseæ ℥iv. Misce.—Strongly recommended by Mr. Foot.

**INJECTIO QUERCUS.**—℞ Decocti quercûs ℔j. Aluminis purificat. ℥ss. Misce.—May be used, when the rectum, or vagina, is disposed to a prolapsus from relaxation, or in cases of gleet.

**INOSCULATION** denotes, in the language of anatomy and surgery, the union of vessels by conjunction of their extremities. It is synonymous with *anastomosis.* (See *this word.*) The great use of inosculations is to facilitate and insure the continuance of the circulation, when the large trunks of vessels are obstructed by pressure, disease, &c. Thus, in cases of aneurism, when the main artery of a limb is tied, the inosculations of the ramifications, given off above the ligature, with other branches arising below it, form at once a channel, through which the lower part of the limb is supplied with blood. Were there no such arrangement, in the human body, as inosculations, aneurisms could never be cured by a surgical operation. So infinitely numerous indeed are these inosculations, that they do the office of the subclavian, carotid and external and internal iliac arteries, when these vessels are tied, and upon this fact is founded the success of some of the most brilliant operations in modern surgery. (See *Aneurism.*) Even the aorta itself may be perfectly obstructed, the circulation go on, and every part be fully supplied with blood. (See *Aorta.*) In dogs, the abdominal aorta has been tied, without the circulation in the hinder extremities being stopped. (See *the Experiments of Mr. A. Cooper in Medico-Chirurgical Trans. Vol. 2. p.* 258.) From the observations of this distinguished surgeon it appears, that the arteries, which form the new circulation in a limb, after the obliteration of the principal artery, are not only enlarged but tortuous. Any great increase, however, in the diameter of the anastomosing vessels is but slowly produced; for Mr. A. Cooper has injected a limb several weeks after the operation for popliteal aneurism, without being able to force the injection through communicating vessels into the parts below. The limb must have active exercise before the vessels enlarge much. On account of the arteries not very readily enlarging, the limbs of persons who have undergone the operation for aneurism, are for a considerable time weaker than natural. They feel the influence of cold more, and are more disposed to ulcerate from slight causes. Hence, the utility of covering them with flannel, or fleecy hosiery. Hence, the rashness of applying cold washes, bandages, &c. (See *A. Cooper's remarks in the above-mentioned vol. p.* 249, *et seq.*)

In another place, the same gentleman has published an interesting description of the anastomoses of the arteries of the groin. "Hypothesis (says he) would lead to a belief, that anastomosing vessels would be numerous in proportion to the time which had elapsed from the operation; but, the reverse of this is the fact; for, at first, many vessels convey the blood, originally conducted by the principal artery. But, gradually, the number of these channels becomes diminished, and, after a length of time, a few vessels, conveniently situated for the new circulation, are becoming so much enlarged, as to be capable of conveying an equal portion of blood to that which passed through the original trunk."

The experience of Mr. A. Cooper also tends to confirm the important fact, that "it is desirable in femoral aneurism, if not, indeed, in all others, to perform the operation in an early state of the disease," as the patient then recovers the use of the limb much more quickly, than when the tumour has been suffered to attain a large size. (See *Medico-Chirurg. Trans. Vol.* 4, *p.* 425, *et seq.*)

**INTERRUPTED SUTURES.** See *Sutures.*

**INTESTINES WOUNDED.** See *Wounds of the Abdomen.*

**INTROSUSCEPTION,** or *Intussesception,* (from *intus,* within, and *suscipio,* to receive.) Called also *Volvulus.* Is a disease, produced by the passing of one portion of an intestine into another, and it is commonly from the upper passing into the lower part. (*J. Hunter.*)

Mr. G. Langstaff has published an interesting paper, on this subject, in the *Edinb. Surg. Journal, No. XI;* which I shall take the liberty of freely quoting.

This gentleman remarks, that the small intestines of children are so often affected with introsusception, in a slight degree, that most practitioners must have had opportunities of observing the form of the complaint. The greatest part of three hundred children, who died either of worms, or during dentition, at the Hospital de la Saltpetriere, and came under the examination of M. Louis, had two, three, four, and even more volvuli, without any inflammation of the parts, or any circumstances leading to a suspicion, that these affections had been injurious during life. "These cases (says M. Louis) seem to prove, that introsusception may be formed, and destroyed again by the mere action of the intestines." (*Mem. de l'Acad. de Chirurg. 4to. tom. 4. p.* 222.) This opinion is confirmed by the authority of Dr. Baillie, (*Morbid Anatomy, 2d edit. p.* 162.) who observes, that, "in opening bodies, particularly of infants, an intussusceptio is not unfrequently found, which had been attended with no mischief; the parts appear perfectly free from inflammation, and they would probably have been easily disentangled from each other by their natural peristaltic motion."

The disease, continues Mr. Langstaff, assumes a more dangerous, and, indeed, generally a fatal form, when it occurs at the termination of the small intestines in the cœcum. A contracted state of the part to be introsuscepted, and a dilatation of that portion of the canal, into which this part must pass, are essential conditions to the formation of a volvulus; and those exist no where so completely as in the situation here alluded to. The extent, to which the affection proceeds in this situation, would appear almost incredible, if it were not proved by well authenticated facts. A person, who considered the natural situation and connexion of the parts, would of course require the strongest evidence, before he would believe, that the ilium, cœcum, ascending, and transverse portions of the colon, may descend into the sigmoid flexure of the latter intestine; nay more, that they may pass through the rectum, and be protruded in the form of a procidentia ani. Such cases, however, are recorded. (*Langstaff in Edinb. Med. and Surg. Journal, No. XI.*)

This gentleman next relates the case of a child three months old, the body of which he inspected after death, and found to confirm the truth of the preceding account. The example was particular in there being in addition to an extensive introsusception in the usual way, a smaller invagination in the opposite direction, like what probably occurred in the case related by Mr. Spry; *Med. and Physical Journal, No. XI.* Sir E. Home, in the *Trans. of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol.* 1. mentions an example of a retrograde introsusception, in which a worm was found coiled up round the introsuscepted part. The disease took place in a boy who had swallowed some arsenic.

If the following mode of accounting for introsusception be just, it will most frequently happen downwards, although there is no reason why it may not take place in a contrary direction; in which case, the chance of a cure will be increased by the natural actions of the intestinal canal tending to replace the intestine; and probably from this circumstance it may oftener occur than commonly appears.

When the introsusception is downwards, it may be called *progressive*, and when it happens upwards, *retrograde*. The manner in which it may take place is, by one portion of a loose intestine being contracted, and the part immediately below relaxed and dilated; under which circumstances, it might very readily happen by the contracted portion slipping a little way into that which is dilated, not from any action in either portion of intestine, but from some additional weight in the gut above. How far the peristaltic motion, by pushing the contents on to the contracted parts, may force these into the relaxed, Mr. Hunter will not determine, but is inclined to suppose, that it will not.

By this mode of accounting for an accidental introsusception, it may take place either upwards or downwards; but if a continuance or an increase of it arises from the action of the intestines, it must be when it is downwards, as we actually find to be the case; yet this does not explain those in which a considerable portion of intestine appears to have been carried into the gut below: to understand these, we must consider the different parts which form the introsusception. It is made up of three folds of intestine; the inner, which passes down, and being reflected upwards, forms the second or inverted portion, which being reflected down again, makes the third or containing part, that is the outermost, which is always in the natural position. (*J. Hunter.*)

The outward fold is the only one which is active, the inverted portion being perfectly passive, and squeezed down by the outer, which inverts more of itself, so that the angle of inversion in this case is always at the angle of reflection of the outer into the middle portion or inverted one, while the innermost is drawn in. From this we can readily see how an introsusception, once begun, may have any length of gut drawn in.

The external portion acting upon the other folds in the same way as upon any extraneous matter, will by its peristaltic motion urge them further; and, if any extraneous substance is detained in the cavity of the inner portion, that part will become a fixed point for the outer or containing intestine to act upon. Thus it will be squeezed on, till at last the mesentery preventing more of the innermost part from being drawn in, will act as a kind of stay, yet without entirely hindering the inverted outer fold from going still further. For it being the middle fold that is acted upon by the outer, and this action continuing after the inner portion becomes fixed, the gut is thrown into folds upon itself; so that a foot in length of intestine shall form an introsusception not more than three inches long.

The outer portion of intestine is alone active in augmenting the disease when once begun; but if the inner one were capable of equal action in its natural direction, the effect would be the same, that of endeavouring to invert itself, as in a prolapsus ani; the outer and inner portions, by their action, would tend to draw in more of the gut, while the intermediate part only would, by its action, have a contrary tendency.

The action of the abdominal muscles cannot assist in either forming, or continuing this disease, as it must compress equally both above and below, although it is capable of producing the prolapsus ani.

When an introsusception begins at the valve of the colon, and inverts that intestine, we find the ilium is not at all affected; which proves that the mesentery, by acting as a stay, prevents its inversion. (*J. Hunter.*)

From the natural attachment of the mesentery to the intestines, one would, at the first view of the subject, conceive it impossible for any one portion of gut to get far within another; as the greater extent of mesentery that is carried in along with it would render its further entrance more and more difficult, and we should expect this difficulty to be greater in the large intestines than in the small, as being more closely confined to their situation; yet one of the largest introsusceptions of any known was in the colon, as related by Mr. Whateley. (*Vid. Phil. Trans. Vol.* 76. *p.* 305.)

The introsusception appeared to have begun at the insertion of the ilium into the colon, and to have carried in the cœcum with its appendix. The ilium passed on into the colon, till the whole of the ascending colon, the transverse arch, and descending colon, were carried into the sigmoid flexure and rectum. The valve of the colon being the leading part, it at last got as low as the anus; and when the person went to stool he only emptied the ilium, for one half of the large intestines being filled up by the other, the ilium alone, which passed through the centre, discharged its contents. (*J. Hunter.*)

Two questions of considerable importance present themselves to the mind in considering this subject; whether there are any symptoms, by which the existence of the affection can be ascertained during life? And whether we possess any means of relieving it, supposing, that its existence could be discovered? The symptoms attending an introsusception, are common to inflammation of the intestines, hernia, and obstruction of the canal, from whatever cause, and a volvulus is the least frequent cause of such symptoms. (*Langstaff.*) In the case, published by this gentleman, and in those related by Mr. Hunter and Mr. Spry, the seat of the disease was clearly denoted by a hard tumour on the left side of the abdomen. This circumstance, together with the impossibility of throwing up more than a very small quantity of fluid in clysters; (*Hevin, Spry, Langstaff,*) and the presence of the other symptoms, would lead us to suspect the nature of the disorder. If the invaginated portion descended so low as to protrude through the anus, and we could ascertain, that it was not an inversion of the gut, the case might be considered as clear, and we should have no hesitation in delivering a prognosis, which, by preparing the friends for the fatal termination, would exonerate us from all blame on its occurrence. (*Langstaff.*)

In the treatment of this disease, bleeding, to lessen the inflammation that might be brought on, and quicksilver to remove the cause, have been recommended.

Quicksilver would have little effect either in one way or the other, if the introsusception were downward; for it is to be supposed that it would easily make its way through the innermost contained gut, and, if it should be stopped in its passage, it would, by increasing its size, become a cause (as before observed) of assisting the disease. In cases of the retrograde kind, quicksilver, assisted by the peristaltic motion, might be expected to press the introsusception back; but even under such circumstances it might get between the containing and inverted gut into the angle of reflection, and, by pushing it further on, increase the disease it is intended to cure. (*J. Hunter.*)

Every thing that can increase the action of the intestine downwards is to be particularly avoided, as tending to increase the peristaltic motion of the outer containing gut, and thus to continue the disease. Medicines can never come into contact with the outer fold, and, having passed the inner, can only act on the outer below, therefore cannot immediately affect that portion of the outer which contains the introsusception; but we must suppose that whatever affects, or comes into contact with the larger portion of the canal, so as to throw it into action, will also affect by sympathy any part that may escape such application. Mr. Hunter therefore advises giving vomits, with a view to invert the peristaltic motion of the containing gut, which will have a tendency to bring the intestines into their natural situation.

If this practice should not succeed, it might be proper to consider it as a retrograde introsusception, and by administering purges endeavour to increase the peristaltic motion downwards. (*J. Hunter.*)

I cannot agree with Mr. Langstaff, that it is to be regretted, Hunter's name should be affixed to the preceding proposal, or that it is an absurd one; for purgatives and emetics were only recommended to increase the peristaltic action, the former downward, the latter upward, according as the supposed nature of the case might require, and this effect they certainly would have, notwithstanding vomiting is an early and constant symptom of the disease, and an insuperable constipation an equally invariable attendant. The method, I allow, however, is not very hopeful, on account of the existence of adhesions. Mr. Langstaff remarks, that the *Recherches Historiques sur la Gastrotomie dans le cas de Volvulus, par M. Hevin,* (*Mem. de l'Acad. de Chirurgie, Tom.* 4, 4*to.*) contain many interesting facts and sound reasoning. There we find a very ample discussion of the question, concerning the propriety of opening the abdomen, in order to disentangle the introsuscepted intestine; a proposal which M. Hevin condemns.

If the equivocal and uncertain nature of the symptoms of volvulus, were not sufficient to deter us from undertaking an operation, which, under the most favourable circumstances, could not fail to be extremely difficult, and imminently hazardous to the patient, the state of the invaginated parts would entirely banish all thoughts of such an imprudent attempt. The different folds of the intestine become agglutinated to each other, so that they can hardly be withdrawn after death; (*Simpson, Edinburgh Med. Essays, Vol. 6, Hevin's 4th Obs. Malcolm, Physical and Lit. Essays, Vol. 2, p. 360. Hunter, Med. and Chir. Trans. and Soemmering in Transl. of Baillie's Morb. Anat.*) the stricture on the introsuscepted part causes it to inflame, and even mortify. (*Soemmering.*) It is very clear, that, in this state of parts, the operation of gastrotomy would be totally inadmissible, even if the symptoms could clearly indicate the nature of the case, and the affected part could be easily reached and examined. (*Langstaff in Edinburgh Medical and Surgical Journal, No. XI.*)

The forcible injection of clysters was found useless by Dr. Monro, and the agglutination of the parts must produce an insuperable obstacle to the bowels being pushed back by this means. (*Langstaff.*) Some have proposed the employment of a long bougie, or a piece of whalebone, to push back the intestine; and this proposal may be adopted, when we are furnished with an instrument, adapted to follow the windings of the large intestine to its origin in the right ilium, without any risk of perforating the gut in its course. (*Langstaff.*)

We must confess, both surgery and medicine are almost totally unavailing in the present disease. Yet, here, as in many other instances, the resources of nature are exhibited in a most wonderful and astonishing manner, while those of art completely fail. The invaginated portion of intestine sometimes sloughs, and is discharged *per anum*, while the agglutination of the parts preserves the continuity of the intestinal canal. The annals of medicine furnish numerous instances, in which long pieces of gut have been discharged in this manner, and the patient has recovered. Hence, some hope may be allowed under the most unpromising circumstances. In a case, related in Duncan's Commentaries, eighteen inches of small intestine were voided *per anum*, Vol. 9, p. 278. Three similar instances occur in M. Hevin's Memoir; twenty-three inches of colon came away in one of these, and twenty-eight of small intestines in another. Other cases occur in the Physical and Literary Essays, Vol. 2, p. 361; in Duncan's Annals, Vol. 6, p. 298; in the Medical and Chirurgical Transactions, Vol. 2; where Dr. Baillie states, that a yard of intestine was voided. The patients did not, however, ultimately survive in every one of these instances. (*Langstaff, in Edinb. Med. and Surgical Journal.*)

For information concerning intussusceptio, I would particularly refer the reader to *M. Hevin in Mem. de l'Acad. de Chir. Hunter's Observations, in the Trans. of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol. 1, p. 103, et seq. L'Encyclopédie Methodique, Partie Chirurgicale; Art. Gastrotomie. And Langstaff's Remarks in the Edinb. Med. and Surgical Journal, No. XI.*

**INVERSION OF THE UTERUS.** See *Uterus, Inversion of.*

**IRIS, PROLAPSUS OF.** As long as the humours, which fill the cavity of the eye, and in which the iris is immersed and suspended, remain in perfect equilibrium with respect to each other, that membrane retains its natural position, and a suitable distance from the cornea. While such an equilibrium continues, the iris, although of a very delicate and yielding texture, contracts, and relaxes itself, without ever forming any irregular fold. But, when the aqueous humour has escaped through an accidental, or artificial, opening in the cornea, the iris is pressed forward by the humours situated behind it, and is urged gradually towards the cornea, until a portion of it protrudes from the eye, at the same opening, through which the aqueous humour made its escape. Thus a small tumour of the same colour as the iris forms on the cornea, and is named, by the majority of surgeons, *staphyloma* of the iris; but, for the sake of distinguishing the disease more particularly from another, to which the term *staphyloma* is more properly applicable, Scarpa prefers calling it, with Galen, *procidentia*, or *prolapsus of the iris.*

The causes of this complaint are such wounds and ulcers of the cornea, as make an opening of a certain extent into the anteriour chamber of the aqueous humour, and such violent contusions of the eyeball, as occasion a rupture of the cornea. If the edges of a wound in this situation, whether accidental, made for the purpose of extracting the cataract, or evacuating the matter of an hypopium (as is the practice of some), be not brought immediately afterwards into reciprocal contact, or continue not sufficiently agglutinated together to prevent the escape of the aqueous humour from the anteriour chamber, regularly as this fluid is reproduced; the iris, drawn by its continual flux towards the cornea, glides between the lips of the wound, becomes elongated, and a portion of it gradually protrudes, beyond the cornea, in the form of a small tumour. The same thing takes place, whenever the eyeball unfortunately receives a blow, or is too much compressed by bandages, during the existence of a recent wound of the cornea. Also, if the patient should be affected, in this circumstance, with a spasm of the muscles of the eye, with violent and repeated vomiting, or with strong and frequent coughing, a prolapsus of the iris may be caused. When an ulcer of the cornea penetrates the anteriour chamber of the aqueous humour, the same inconvenience happens more frequently, than when there is a recent wound of that membrane; for, the solution of continuity in the cornea, arising from an ulcer, is attended with loss of substance, and in a membrane so tense, and compact, as this is, the edges of an ulcer do not admit of being brought into mutual contact.

The little tumour is likewise necessarily of the same colour as the iris, viz. brown, or greyish, being surrounded at its base by an opaque circle of the cornea, on which membrane there is an ulcer, or a wound of not a very recent description.

As it usually happens, that the cornea is only penetrated at one part of its circumference by a wound, or ulcer, so in practice we commonly meet with only one prolapsus of the iris in the same eye. But, if the cornea should happen to be wounded, or ulcerated, at several distinct points, the iris may protrude at several different places of the same eye, forming an equal number of small projecting tumours on the surface of the cornea. Scarpa has seen a patient, who had three very distinct protrusions of the iris on the same cornea, in consequence of three separate ulcers, penetrating the anteriour chamber of the aqueous humour; one in the upper, and two in the lower segment of the cornea.

If we reflect a little on the delicate structure of the iris; the great quantity of blood-vessels, which enter it; and the numerous nervous filaments, which proceed to be distributed to it, as a common centre; we shall easily conceive the nature, and severity of those symptoms, which are wont to attend this disease, how small soever the portion of the iris projecting from the cornea may be, even if no larger than a fly's head. The hard and continual frictions, to which this delicate membrane is then exposed, in consequence of the motions of the eyelids; together with the access of air, tears and gum to it; are causes quite adequate to the production of continual irritation; and the blood, which tends to the point of the greatest irritation, cannot fail to render the projecting portion of the iris much larger, almost directly after its protrusion, than it was at the moment of its first passing through the cornea. Hence, it becomes, soon after the prolapsus, more incarcerated and irritated, than it was at first. In the incipient state of the complaint, the patient complains of a pain, similar to what would arise from a pin penetrating the eye; next he begins to experience, at the same time, an oppressive sensation of a tightness, or constriction, over the whole eye-ball. Inflammation of the conjunctiva, and eyelids, a burning effusion of tears, and an absolute inability to endure the light, successively take place. As the protruded portion of the iris drags after it all the rest of this membrane, the pupil assumes of mechacal necessity an oval shape, and deviates from the centre of the iris towards the seat of the prolapsus. The intensity of the pain, produced by the inflammation, and other symptoms, attendant on the prolapsus of the iris, does not, however, always continue to increase.

Indeed, in practice, cases of old protrusions of the iris often occur, where, after the disease has been left to itself, the pain and inflammation spontaneously subside, and the tumour of the iris becomes almost completely insensible. Scarpa mentions his having seen a man, fifty years of age, who had had a prolapsus of the iris in the right eye ten weeks; it was as large as two grains of millet seed; the patient bore it with the greatest indifference, and without any other inconvenience, than a little chronic redness of the conjunctiva, and a difficulty of moving the eye-ball freely, in consequence of the friction of the lower eyelid against the tumour formed by the iris. When the extremity of the finger was applied, the little tumour seemed hard and callous to the touch.

This phenomenon was partly owing to the constriction, which the base of the tumour of the iris suffered between the lips of the wound, or ulcer of the cornea. The protruded portion of the iris loses its natural exquisite sensibility, in consequence of such compression, or strangulation. The occurrence was also partly ascribable to the iris being deprived of its vitality by the induration, and callosity, which were occasioned by the long exposure of this membrane to the air, and tears.

In the early stage of this disease, some direct the iris to be replaced in its proper situation by means of a whalebone probe; and, in case of difficulty, to make a dilatation of the wound, or ulcer, of the cornea, by an incision, proportioned to the exigency of the case, as we are accustomed to do, in order to return a strangulated intestinal hernia. Others only recommend stimulating the prolapsed portion of the iris, with a view of making it contract and shrink into the eye; or suddenly exposing the eye affected to a very vivid light, in the belief, that, as the pupil then forcibly contracts, the piece of the iris, engaged between the lips of the wound, or ulcer of the cornea, will rise to its proper place. However, Scarpa strongly contends that all such methods are absolutely useless, and even dangerous. Supposing it were possible, by such attempts, to reduce the iris to its proper situation, without tearing, or injuring it in any manner whatever, still the aqueous humour would escape as before, through the wound, or ulcer of the cornea, so that the iris, when replaced, would fall down, the moment afterwards, and project from the cornea, in the same way as before the operation.

It cannot be denied, that the prolapsus of the iris is an afflicting accident: but, when it is remembered, that surgery has no means of suppressing at once, or, at least, of suspending the escape of the aqueous humour through a wound, much less through an ulcer of the cornea, when either exceeds certain limits, the prolapsus of the iris, far from being an evil in such unfavourable circumstances, will be found rather useful, and, perhaps, the only means of preventing the total loss of the organ of sight; for, the flap of the iris insinuates itself, like a plug, between the edges of the wound, or ulcer of the cornea, and thus completely prevents the exit of the aqueous humour.

In consequence of this fluid being quickly regenerated, and unable to escape any longer through the cornea; it prevents the further protrusion of the iris, removes the rest of this membrane to a greater distance from the cornea, and, by re-establishing the equilibrium between it and the humours of the eye, resists the total loss of sight. If this be evident of itself, it is equally obvious, that every known method, adapted to replace the prolapsus of the iris, must be useless, or dangerous.

In conformity to such principles, there are two principal indications for the surgeon to accomplish, in the treatment of the recent prolapsus of the iris. The first is, to diminish, as speedily as possible, the excess of exquisite sensibility in the protruded part of the iris; the other is gradually to destroy the projecting portion of this membrane, to such a depth, as shall be sufficient to prevent the little tumour from keeping the edges of the wound, or ulcer of the cornea, too much asunder, and, at length, retarding the cicatrization. The adhesion, however, which connects the iris with the inside of the cornea, must not be destroyed.

To fulfil these indications, nothing is more effectual than touching the portion of the iris projecting from the cornea, with the oxygenated muriate of antimony (*butter of antimony*), or with what is more expeditious and convenient, the argentum nitratum, so as to form an eschar of such a depth as occasion may require. That this operation may be effected with quickness and precision, it is necessary that an assistant, standing behind the patient's head, should support the upper eyelid with Pellier's elevator; and that the patient, if endued with reason, should keep his eye steadily fixed on one object.

While the assistant gently raises the upper eyelid, the surgeon must depress the lower one, with the index and middle fingers of his left hand; while, with the right, he is to be ready to touch the little prominence formed by the iris, with the argentum nitratum, scraped to a point like a pencil. This is to be applied to the centre of the little tumour, until an eschar of sufficient depth is formed. The pain which the patient experiences at this moment, is very acute; but, it subsides as soon as the eye is bathed with warm milk. The caustic, in destroying the projecting portion of the iris, destroys the principal organ of sensibility, by covering it with an eschar, of sufficient depth to protect the part affected from the effect of the friction of the eyelids, and from coming into contact with the air and tears. This is the precise reason, not only why the sense of pricking and constriction in the eye, of which such patients complain so much, abates after the application of the caustic, but also why the inflammation of the conjunctiva undergoes a considerable diminution, as well as the burning and copious effusion of tears.

As in the case of ulcer of the cornea, these advantages only last while the eschar remains adherent to the little tumour formed by the iris; when it falls off, as it usually does two or three days after the use of the caustic, all the above-mentioned symptoms are rekindled, with this difference, that they are less intense and acute, than they were previously, and the tumour of the iris is not so prominent as it was before the caustic was applied. When these symptoms make their appearance, the surgeon must once more have recourse to the argentum nitratum, with the precautions explained above; and he is to employ it a third, and even a fourth time, as occasion may require, until the prominent portion of the iris is sufficiently reduced to a level with the edges of the wound, or ulcer of the cornea, and no obstacle to the granulating process, and complete cicatrization continues.

There is a certain period, (as was stated in the article, *Cornea, Ulcers of*) beyond which, the application of caustic to the protruded iris, becomes exceedingly dangerous, though at first it may have been highly beneficial; beyond which, the eschar, which previously soothed the pain, exasperates it, and re-produces the inflammation of the conjunctiva in almost as vehement a degree as in the beginning of the disease. This appears to Scarpa to be the case, whenever the surgeon continues to employ the caustic, after the little tumour of the iris has been destroyed to a level with the external edges of the wound, or ulcer of the cornea, and the application begins to destroy the granulations just as they are originating. Hence, in the treatment of this disease, as soon as the surgeon perceives, that the part of the iris, projecting from the cornea, is sufficiently lowered, and that the application of the argentum nitratum, far from allaying, only irritates the disease, he must desist entirely from using the caustic, and be content with introducing between the eye and eyelids, every two hours, a vitriolic collyrium with the mucilage of quince-seeds, or one composed of the sulphate of zinc and white of egg. He is to employ, successively every morning and evening, Janin's ophthalmic ointment, qualified with a double, or triple proportion of lard. If the stimulus of such local remedies should not disturb the work of nature, the ulcer is constantly seen to diminish gradually in size, and, in the course of a fortnight, to become covered with a cicatrix.

The adhesion, which the projecting part of the iris contracts to the internal margin of the wound, or ulcer of the cornea, during the treatment, continues the same after the perfection of the external cicatrix, and of course during the rest of the patient's life. Hence, even after the most successful treatment of the prolapsus of the iris, the pupil remains a little inclined towards the place of the cicatrix in the cornea, and of an oval figure. The change in the situation and shape of the pupil causes, however, little or no diminution of the patient's faculty of discerning distinctly the smallest objects; and is much less detrimental to the sight, than one, inexperienced in these matters might conceive; provided the scar on the cornea be not too extensive, nor situated exactly in the centre of this membrane. In the first case, the sight is the less obstructed, as the pupil, which, on the first occurrence of the prolapsus, was narrow, oblong, and drawn considerably towards the wound, or ulcer, gradually enlarges, and forms a less contracted oval. As soon as the wound is completely healed, the pupil tends, in some degree, to occupy its former situation in the centre of the cornea; a fact, which has also been noticed by Richter.

The mode of treating the prolapsus of the iris here explained, is what Scarpa has found to be the safest, and most effectual of all the methods, which have hitherto been proposed; not excepting that of removing the little tumour, formed by the iris on the surface of the cornea, by a stroke of the scissars.

Certainly, if the success of such a recision were to correspond, in all cases, with the promises, which some surgeons have made, nothing would contribute in a greater degree to expedite the cure of the prolapsus of the iris. But, experience has informed Scarpa, that this recision can only be practised with a hope of success, when the iris has contracted a firm adhesion to the internal edge of the wound, or ulcer of the cornea; and, more especially, in that ancient prolapsus of the iris, in which the projecting portion of the iris has become with time almost insensible, hard, and callous, with its base strangulated between the edges of the wound, or ulcer of the cornea, and besides being adherent to them, having also the shape of a slender pedicle. Scarpa adds, he has seen an incarcerated one fall off of itself.

In such circumstances, the recision of the old prolapsus of the iris is not attended with the least danger; for, after removing with a stroke of the scissars, that prominent portion of the iris, which has already contracted internal adhesions to the ulcerated margin of the cornea, so as to reduce it to a level with the external edges of the ulcer, there is no hazard of renewing the effusion of the aqueous humour, or giving an opportunity for another piece of the iris to be protruded. One, or two applications of the argentum nitratum suffice afterwards for the production of granulations on the ulcer of the cornea, and the formation of a cicatrix. But, it is not so, in the treatment of the recent prolapsus of the iris, which has no adhesions to the internal edges of the wound, or ulcer of the cornea.

In four subjects recently affected with prolapsus of the iris, after Scarpa had removed, with a pair of convex-edged scissars, a portion of that membrane projecting beyond the cornea, of about the size of a fly's head, it was with regret that he found, on the ensuing day, that a new portion of the iris, not less than the first, had made its way through the ulcer of the cornea, and that the pupil was very much contracted, and drawn considerably further towards the ulcer of the cornea. These circumstances took place, notwithstanding he touched the wound immediately afterwards with the argentum nitratum, as well as the edges of the ulcer of the cornea. He has therefore cause to fear, should he ever have occasion to divide such a little tumour again, that it would reappear, and always with an additional protrusion of the iris, and a further distortion of the pupil. Hence, the first lesson has made him content to treat the disease with caustic, in the manner explained above; and all the four subjects in question were successfully cured, excepting that their pupils, in consequence of being drawn too much towards the situation of the ulcer of the cornea, were more covered than they ought to have been, by the cicatrix.

Before concluding this article, we beg the attention of surgeons, to a particular species of prolapsus, much less frequent, indeed, than that of the iris; but, which does occur in practice, and, in Scarpa's opinion, is very improperly termed by modern oculists, *"prolapsus of the tunic of the aqueous humour."* (*Janin, Pellier, Guérin, Gleize, &c.*)

This disease consists of a transparent vesicle, filled with an aqueous fluid, and composed of a very delicate membrane, which projects from the wound, or ulcer of the cornea, much in the same way as the iris does under similar circumstances. Scarpa has several times seen this transparent vesicle full of water, elongating itself beyond the cornea, shortly after the operation for the extraction of the cataract, and sometimes, also, in consequence of an ulcer of the cornea, especially after rescinding a prolapsed portion of the iris.

Oculists are, for the most part, of opinion, that this little transparent tumour consists of the delicate, elastic, diaphanous membrane, which invests the inner surface of the cornea, and is described by Descemet and Demours. "As soon as the membrane lining the cornea (they say) is exposed by the wound, or ulcer of the latter, and the delicate pellicle can no longer resist the impulse of the humours pressing behind it, it is necessitated to yield gradually, to become elongated, and to project from the wound, or ulcer of the cornea, exactly in the form of a pellucid vesicle." But, how remote this theory is from the truth, must be manifest to every one, who reflects at all on the following circumstances: 1. The delicate and elastic pellicle, described by Descemet and Demours, is not separable by any artifice from the inner surface of the cornea, except near where the cornea and sclerotica unite. Since these protruded vesicles make their appearance in practice at every point of the cornea, and even at its very centre, where the above pellicle is certainly neither separable, nor distinct from the compact texture of the cornea; it may at least be asserted, that the tunic of the aqueous humour does not, in every instance, constitute the transparent vesicle in question. 2. It is a well known fact, that this vesicular, pellucid prolapsus happens more frequently after the extraction of the cataract, than on any other occasion. In this case, since the tunic of the aqueous humour has certainly been divided to afford an exit to the crystalline, no one can be of opinion, that the transparent vesicle, which protrudes from the cornea after this operation, ought to be attributed to the distention and protrusion of the tunic of the aqueous humour. 3. If, in cases of ulcers of the cornea, the transparent vesicle should sometimes appear after the recision of the prolapsus of the iris, it is obvious, that if it consisted of the tunic of the aqueous humour, it ought invariably to appear before the prolapsus of the iris. 4. Should the surgeon remove the protruded vesicle to a level with the cornea by a stroke of the scissars, a small quantity of limpid water is seen to ooze out, at the moment when the incision is made, without any part of the aqueous humour escaping from the anterior chamber. This inconvenience would be inevitable, were the protruded vesicle in question formed by the delicate elastic pellicle, which is said to invest the inner surface of the cornea. Besides, the little transparent tumour disappears when the incision is made; but oftentimes another one, exactly similar to what was cut off, is found in the very same place on the following day. Had the little transparent tumour been composed of the tunic of the aqueous humour, elongated out of the wound, or ulcer of the cornea, it could not at all events have been reproduced at the same part of the cornea.

Actuated by such reflections, it is clear to Scarpa, that the pretended prolapsus of the tunic of the aqueous humour, is not what it is imagined to be; but, strictly speaking, nothing more than a forcible protrusion of a portion of the vitreous humour, which, from too much pressure being made on the eye, either at the time of the operation, or afterwards, or from a spasm of the muscles of the eye, insinuates itself between the edges of the wound after the extraction of the cataract, and projects in the form of a transparent vesicle. The same thing also happens after ulcers of the cornea, whenever the aqueous humour has escaped, and a portion of the vitreous humour is urged by forcible pressure towards the ulcer facing the pupil; or whenever an elongated piece of the vitreous humour, after the recision of a prolapsed portion of the iris, passes by a shorter route, than through the pupil, between the lips of the ulcer of the cornea. At length, we understand, why in both these instances a transparent vesicle forms, even after the recision of the tunic of the aqueous humour, or ulceration of the cornea; and why it very often reappears in the same place, though it has been cut away to a level with the cornea. It is because one or more cells of the vitreous humour, constituting the transparent vesicle, are succeeded after their removal by other cells of the same humour, which glide between the lips of the wound, or ulcer of the cornea, into the situation of the preceding ones.

The treatment of this species of prolapsus consists in removing the transparent vesicle, projecting from the wound, or ulcer, by means of a cutting instrument, and bringing the edges of the wound of the cornea immediately afterwards into perfect apposition, in order that they may unite together as exactly as possible. But, when there is an ulcer of the cornea, as soon as the vesicle is removed, the sore must be touched with the argentum nitratum, so that the eschar may resist any new prolapsus of the vitreous humour, and at the same time dispose the ulcer of the cornea to granulate and heal.

In this kind of prolapsus, what protrudes through the cornea is only a subtile little membrane, filled with water, and quite destitute of sensibility. Its detachment from the rest of the eye, is a matter of trivial importance; while, on the contrary, its presence occasions all the inconveniences of an extraneous substance, that would prevent a wound from uniting, and an ulcer from healing. Hence, the detachment of the protruded vesicle is very justly indicated, and the success of the plan is confirmed by practice; doubtless, because the little transparent tumour can, in general, be expeditiously removed, by a stroke of the curved convex-edged scissars. But if, in some particular cases, the vesicle should not project sufficiently from the wound, or ulcer of the cornea, to be included in the scissars, the same object may be accomplished by puncturing the tumour with a lancet, or couching-needle; for, when the limpid fluid which it contains is discharged, the membrane forming it shrinks within the edges of the wound, or ulcer of the cornea, and no longer hinders the union of the former, or the cicatrization of the latter.

Should the transparent tumour reappear in the same situation, the day after its recision, or puncture, it is right to repeat one of these operations, and to adopt further measures for maintaining the wound of the cornea in contact; or, if it should be an ulcer, the eschar must be made to adhere more deeply to its bottom and sides, so as to form a greater obstacle than before to the escape of the vitreous humour. In these circumstances, the surgeon must take all possible care to obviate such causes as have a tendency to propel the vitreous humour towards the wound, or ulcer, of the cornea; particularly too much pressure on the eyelids, spasms of the muscles of the eye, coughing, sneezing, efforts at stool, and other similar ones; and care must also be taken to check the progress of inflammation.

Pellier's two cases (*Obs. sur l'Œil, p.* 350.) on the treatment of this species of transparent vesicular prolapsus, deserve perusal. To these, if it were requisite, Scarpa says he could add several other similar examples, which have fallen under his own observation, in cases of ulcer of the cornea penetrating the anterior chamber of the aqueous humour, and which were attended with as much success as those related by the French oculist.

The choroid coat is, likewise, not exempt from prolapsus. Scarpa has seen and cured this complaint in M. Bressanini, an apothecary at Bescape. A small abscess, formed between the sclerotica and choroid coats, at the distance of two lines from the union of the cornea with the sclerotica, in the inferior hemisphere of the globe of the eye, in consequence of a severe internal and external ophthalmy, which had been treated, in its incipient state, with repellent remedies. The abscess burst, and discharged a small quantity of thick viscid lymph; then a small blackish body, composed of the choroid coat, presented itself on the outside of the little ulcer of the sclerotica. The treatment consisted in applying the argentum nitratum several times to the projecting portion of the choroides, until it was consumed, and reduced to a level with the bottom of the ulcer of the cornea. Then the place healed. The eye remained, however, considerably weakened, and the pupil became afterwards, so much contracted, that it was almost entirely closed. (*Scarpa sulle Principali Malattie degli Occhi. Venezia.* 1802.)

Consult also *Richter's Anfangsgrunde der Wundarzneykunst, Band* 3, *Von dem Vorfalle der Regenbogenhaut.*

For a description of the manner of dividing the iris, in order to make an artificial pupil, when the natural one is closed, refer to *Pupil, Closure of.*

A wound of the iris is one of the things most to be feared in extracting a cataract. No sooner does any instrument penetrate the eye, than the muscles of this organ usually contract in a spasmodic manner, so as to make great pressure on the part, and to urge forward the cataract and the iris. In this circumstance, we cannot wonder that the latter should now and then be injured by the edge of the instrument. When the iris becomes entangled under the knife, Wenzel asserts, that it may be invariably disengaged without injury, by gently touching the cornea with the finger. Richter justly observes, however, (*Anfangsgr. der Wundarzn.*) that this artifice is not unattended with some risk of pressing out the aqueous humour; especially, if the irritation of touching the eye should make it move, or the operator in the least disturb the knife. See *Cataract.*

**ISCHU'RIA.** (from *ισχω*, to restrain; and *ȣρον*, the urine.) A suppression, or stoppage of the urine.

The distinction between a *suppression* and *retention* of urine, is practical and judicious. The former most properly points out a defect in the secretion of the kidneys; the latter, an inability of expelling the urine when secreted. (*Hey.*)

The first disease is not very common, is named *ischuria rênalis*, or *suppression of urine*, and belongs to the province of the physician; the second is an exceedingly frequent disorder, is named *ischuria vesicalis*, or *retention of urine*, and its treatment is altogether surgical. Every thing relative to it will be found in the articles *Catheter*, and *Urine, Retention of*.

ISSUE signifies an ulcer made designedly by the practitioner, and kept open a certain time, or even the patient's whole life, for the cure, or prevention of a variety of diseases.

The physician, in his practice, has frequent occasion to recommend the making of an issue, and the surgeon finds it a principal means of relief in several important cases, as, for instance, the white swelling, the disease of the hip-joint, caries of the vertebræ, &c. Many persons are never in health, or, at least, fancy themselves always ill, unless they have an issue formed in some part of their body or another. The making of an issue, indeed, is not unfrequently considered as an imitation of nature, who, of her own accord, often forms ulcers and abscesses in various parts of the body (as is not uncommonly conjectured) for the purpose of discharging pernicious humours, whereby people are supposed to be freed from grievous disorders, and have their health preserved. The humoral pathologists were excessively partial to these notions, which, at the present time, will be found by every experienced practitioner to influence the mass of mankind, and render the formation of issues more common, than perhaps is consistent with the better established principles of medical science. Few old subjects will allow a sore of long standing to be dried up (as the expression is), without requiring the surgeon immediately afterwards to make an issue for them. When an ulcer has existed a great length of time, the constitution may possibly become so habituated to it, that the health may really suffer from its being healed. Asthmatic complaints, and severe headachs are frequently observed to follow the cicatrization of an old ulcer; but, whether they would have happened, if an issue had been made in time, is a question difficult of positive determination; for, many persons with old ulcers are not prevented from suffering from asthma, and headach. The plan of making an issue, however, is commendable both as rational and exempt from danger. Whatever may be the solidity of the theories, which have been offered by medical writers, in regard to issues, the practitioner, who has his eyes open, cannot fail to see the benefit often derived from such means; and if there be any unquestionable facts in medicine and surgery, we may confidently set down amongst them the frequent possibility of relieving one disease by exciting another of a less grievous and more curable nature.

There are two ways of making an issue; one is with a lancet, or scalpel; the other, with caustic.

The place for the issue being fixed upon, the surgeon and his assistant are to pinch up a fold of the integuments, and, with a lancet or knife, make in them an incision of sufficient size to hold a pea, or as many peas as may be thought proper. The pea, or peas are then to be placed in the cut, and covered with a piece of adhesive plaster, a compress, and bandage. The peas, first inserted, need not be removed for three or four days, when suppuration will have begun; but, the issue is afterwards to be cleaned and dressed every day, and have fresh peas put into it. The preceding is the ordinary method of making such issues, as are intended to contain only one or two peas.

When the issue is to be larger, which is generally proper, in cases of diseased vertebræ, white swellings, &c. the best plan is to destroy a portion of the integuments with caustic. The kali purum, blended with quicklime, is mostly preferred for this purpose. The situation and size of the issue having been determined, the surgeon is to take care, that the caustic does not extend its action to the surrounding parts. With this view, he is to take a piece of adhesive plaster, and having cut a hole in it, of the exact shape and size of the issue intended to be made, he is to apply it to the part. Thus the plaster will defend the adjacent skin from the effects of the caustic, while the uncovered portion of integuments, corresponding to the hole in the plaster, is that which is to be destroyed. The caustic is to be taken hold of with a bit of lint, or tow, and its end, having been a little moistened with water, is to be steadily rubbed upon the part of the skin, where the issue is to be formed. The frictions are to be continued, till the whole surface, intended to be destroyed, assumes a darkish corroded appearance. The caustic matter may now be carefully washed off with some wet tow. The plaster is to be removed, and a linseed poultice applied. As soon as the eschar is detached, or any part of it is loose enough to be cut away, without pain, or bleeding, the peas are to be inserted and confined in their proper place with a piece of adhesive plaster. Some use beans for the purpose; others beads; which answer very well, and have the advantage of serving for any length of time, when washed and cleaned every day. If the issue is at all of a longitudinal shape, the peas, beans, or beads, may be more easily kept in their places, when strung upon a thread.

Issues ought always to be made, if possible, in a situation, where the peas will not be much disturbed in the ordinary motions of the body, nor interfere with the actions of muscles. The interspaces, between the margins and insertions of muscles, are deemed the most eligible places. Thus, issues in the arm are usually made just at the inferior angle of the deltoid muscle, by the side of the external edge of the biceps. In the lower extremities, issues are often made at the inner side of the thigh, immediately above the knee, in a cavity, that may be readily felt there with the fingers. Sometimes, issues are made upon the inside of the leg, just below the knee. For the relief of any affections of the head, or eye, the nape of the neck is commonly selected as a good situation. In caries of the vertebræ, they are made on each side of the spinous processes. In cases of diseased hips, they are formed in a depression just behind and below the trochanter major. When the nature of the disorder does not particularly indicate the situation for the issue, the arm should be preferred to the leg, as issues upon the upper extremities, especially the left arm, are much less annoying, than upon either of the lower limbs.

The great art of keeping an issue open for a long while, consists in maintaining an equal and effectual pressure upon the peas, by which means, they are confined in their places, little depressions are made for them, and the granulations hindered from rising. Compresses of pasteboard and sheet-lead will often be found highly useful. This plan is the surest one of preventing the issue from healing, and the most likely to save the patient all the severe and repeated suffering, which the fresh application of the caustic, or the use of stimulating powders, in order to renew the sore and repress the fungous flesh, unavoidably occasion.

There is a method of making issues with the caustic made into a sort of paste, which is laid upon the part left uncovered by the adhesive plaster. It seems to me to be a more tedious and painful plan, and I do not recommend it.

It has been suspected, that the pain, arising from the caustic, might be lessened, by mixing opium with the application; but, the idea seems not at all probable; the destruction of a part of the skin must inevitably cause considerable pain, with whatever substance it is produced, and opium itself, so far from being likely to diminish the agony, is itself a violent stimulus, whenever it comes into contact with the exposed extremities of the nerves.

# J.

**JOINTS, DISEASES OF.** The joints are subject to numerous diseases which are more, or less, alarming, according to their nature. Like all other parts, they are liable to inflammation and abscesses; their capsules frequently become distended with an aqueous secretion, and the disease termed *hydrops articuli*, is produced; but, the most important of all their morbid affections, are, what are called *white swellings* and the *disease of the hip-joint.*

### WOUNDS OF JOINTS.

By the wound of a joint, surgeons mean a case, where the capsular ligament is penetrated, or divided. The injury is often accompanied with a division of the lateral, or other ligaments, and sometimes also with that of the cartilages and bones. That the capsular ligament is wounded may generally be learned by the introduction of a probe, and frequently by a discharge of a transparent viscid fluid, called the synovia. But, as a similar discharge may proceed from mere wounds of the bursæ mucosæ, we might form an erroneous judgment, were we unacquainted with the situation of these little membranous bags. M. Boyer informs us, that he has seen several cases, in which, a fluid, resembling synovia, was discharged from wounds of the sheaths of tendons. (See *Traité des Maladies Chirurg. T.* 4. *p.* 408.) Here, the advice which I have given in another place, (See *Wounds of the Abdomen,*) respecting the temerity of being too officious with the probe, is equally important, inasmuch as the rough introduction of this instrument into a large joint, like the knee, would be very likely to excite inflammation of the synovial membrane, and a train of dangerous and even fatal consequences; while the information, gained by such employment of the probe, is of little use; because, whenever a wound is suspected to reach into the capsular ligament, exactly the same treatment should always be followed, as if the joint were positively known to be penetrated.

Notwithstanding simple wounds of even the large joints often heal favourably, without the occurrence of any bad symptoms, this is not constantly the case, and the records of surgery furnish many examples, in which the most alarming and fatal consequences ensued.' (See *Hunter's Commentaries, Part* 1, *p*. 69.) When properly treated, punctured wounds of the joints (says Boyer) are not in general attended with danger; but, as some of these wounds, which were apparently quite simple, have been observed to be followed by very bad symptoms, and even by death, we should always be extremely circumspect in giving the prognosis. (See *Traité des Mal. Chir. T*. 4, *p*. 409.) The treatment of punctured wounds of the joints consists in endeavouring to heal the injury by the first intention; in applying cold lotions; forbidding all motion of the part; and employing bleeding and other antiphlogistic remedies.

In the work last quoted, Baron Boyer relates two cases of punctured wounds of the elbow joint which healed up in a few days, without any unfavourable symptom whatsoever. He acknowledges, however, that these accidents do not always go on so well, and that the consequences are sometimes of a perilous description.

Incised wounds of the articulations may be entirely simple, and present only one indication; viz. that of healing the part by the first intention. At the moment of the accident, some of the synovia is always discharged, which indicates that the capsular ligament is wounded. Should this circumstance not have been noticed at first, the surgeon may see the synovia flow out again, if he move, or press upon the joint. But, in making this examination, the greatest gentleness should be used, lest the irritation of the capsular ligament be increased. When the wound is large, and there is no considerable thickness of soft parts over the joint, the articular surfaces are exposed to view, and may readily be known by the white cartilages covering them.

The prognosis of an incised wound of a joint is not generally unfavourable, when the edges have been immediately brought together; the cavity of the joint has not been long exposed, and blood is not extravasated in it. This last danger is also exaggerated, as will be noticed, in speaking of collections of blood in joints. With these exceptions, says Boyer, the wound may heal as readily, as if the joint were not opened, and he has cited several facts in proof of this statement. Its truth is also confirmed by the success which attends operations, practised for the purpose of extracting cartilaginous substances from the knee.

The principal object is to heal the wound by the first intention. The rest of the treatment consists in doing every thing possible to prevent inflammation of the joint, by perfect quietude of the part; the use of cold applications; &c.

We repeat, however, that wounds of the joints do not always heal in the above favourable manner. Even amongst those cases, which appear the most slight and simple, there are but too many, which are followed by such aggravated symptoms, as either prove fatal, or occasion a necessity for amputation. And, in other instances of a less grievous description, when the patient is cured, the termination of danger is not without an anchylosis, by which the motion and functions of the joint are permanently destroyed.

The experienced Mr. Hey has noticed wounds of the joints, and made some pertinent remarks on the subject. He states, that, in these cases, the utmost care should be taken to *prevent* inflammation. "Upon this circumstance chiefly depends a successful termination. I have seen (says he) many large wounds of the great joints healed without the supervention of any dangerous symptoms, where due care has been taken to prevent inflammation; whilst injuries, apparently trifling, will often be followed by a train of distressing and dangerous consequences, where such care has been neglected. It is generally easier to prevent inflammation in the joints, after a wound, than to arrest its progress when once begun. I speak now of inflammation affecting the capsular ligament. A slight degree, and tenderness in the integuments only, is of little consequence; but, when the capsular ligament becomes inflamed, the formation of abscesses attended with a high degree of fever, and ultimately a stiffness of the joint, are the common consequences, if the life of the patient is preserved." (See *Hey's Practical Observations in Surgery, p*. 354, *Edit*. 2.)

For facts, in confirmation of the foregoing account, I particularly refer the reader to several cases recorded in this last publication, *p*. 355 *et seq*. and in *Boyer's Traité des Maladies Chirurgicales,T*. 4, *p*. 426, *&c*.

When the large joints, particularly the knee, are wounded, the stomach is frequently very much affected. I remember being shewn by Mr. Best of Newbury, a man, who, in his occupation as a wheelwright, happened to give himself a wound on one side of the knee: a good deal of inflammation and suppuration ensued; but, what particularly struck me, was the manner in which the man complained of the affection of his stomach.

In speaking of cartilaginous substances in the joints, we shall have occasion to advert again to the danger attendant on wounds of these parts.

### INFLAMMATION OF JOINTS.

Idiopathic cases of this kind are not common. The complaint ordinarily originates, in consequence of a contusion, sprain, wound, or some other kind of injury, done to the part affected.

The inflamed joint shews the common symptoms of inflammation; viz. preternatural redness, increased heat, throbbing, pain, and swelling, while the constitution is also disturbed by the usual symptoms of the inflammatory fever. It is highly deserving notice, however, that in these cases, such symptoms are often exceedingly severe, and the pulse is more frequent, and less full and strong, than when parts, more disposed to return to a state of health, are affected. The inflammation first attacks some part of the capsular ligaments, and very quickly diffuses itself universally over their whole extent, as usually happens in all inflammations of smooth membranes.

The capsules of the joints are naturally not very sensible; but, like many other parts similarly circumstanced, they become acutely painful, when inflamed. The complaint is accompanied with an increased secretion of the synovia, which becomes of a more aqueous, and of a less albuminous quality, than it is in the healthy state. Hence, this fluid is not so well calculated for lubricating the articular surfaces, and preventing the effects of friction, as it is in the natural condition of the joint. This circumstance may explain, why a grating sensation is often perceived on moving the patella, when the knee is inflamed.

The capsular ligaments, like other parts, are frequently thickened by inflammation, and, sometimes, coagulating lymph, being effused on their internal surfaces, organized cartilaginous, or osseous bodies, are formed in their cavities.

It has been explained by Mr. Brodie, that the usual consequences of inflammation of the synovial membrane, or capsular ligament, are; 1st. a preternatural secretion of synovia. 2nd. an effusion of coagulating lymph into the cavity of the joint. 3rd. a thickening of the synovial membrane, a conversion of it into a substance resembling gristle, and an effusion of coagulable lymph, and probably of serum into the cellular structure, by which it is connected with the external parts. The same gentleman has seen several cases, where, from the appearance of the joint, and the symptoms, there was every reason to believe, that the inflammation had produced adhesions of the reflected fold of the membrane to each other: and, in dissection, he has occasionally observed adhesions, which might have arisen from inflammation at some former period. "These effects of inflammation of the synovial, very much resemble those of inflammation of the serous membranes. There are, however, some points of difference. In the former, I have reason to believe, that suppuration rarely takes place independently of ulceration; but, this is a frequent occurence in the latter. Inflammation of the peritonæum, or pleura, though very slight in degree, and of very short duration, terminates in the effusion of coagulable lymph; but, it is only violent, or long continued inflammation, which has this termination in the membranes of joints." (*Brodie in Medico Chir. Trans. Vol.* 4, *P.* 216.)

When the inflammation attains a high pitch, an abscess may occur in the capsular ligament. This part at length ulcerates, and the pus makes its way beneath the skin, and is, sooner, or later, discharged through ulcerated openings.

An abscess rarely takes place in an important articulation, in consequence of acute inflammation, without the system being, also, so deranged, that life itself is imminently endangered. In the violent stage of the inflammation, just before the abscess forms, very severe symptoms of inflammatory fever afflict the patient, and, occasionally, delirium and coma taking place, death itself ensues.

In these cases, the inflammatory fever is very quickly converted into the hectic; indeed, when an abscess has taken place in a large joint, in consequence of acute inflammation, hectic symptoms almost immediately begin to shew themselves, and the strong actions of the common inflammatory fever suddenly subside.

Local consequences, even worse than those above described, may follow inflammation of a joint. As the layer of the capsular ligament, reflected over the cartilages of the articulation is often inflamed, the cartilages themselves are very apt to have the inflammation communicated to them. Parts partaking of a cartilaginous structure, being very incapable of bearing the irritation of disease, often ulcerate, or, in other words, are absorbed, so as to leave a portion, or, the whole, of the articular surface of the bones, completely denuded of its natural covering. At length, the heads of the bones themselves inflame, and become carious; or the consequence may be an anchylosis.

Sometimes, only such parts, as are exterior to the capsular ligament, are affected, and, in this case, the symptoms are never so severe, (*Russell on the Knee, p.* 60.) nor so obstinate, as when the complaint interests the capsular ligament, and parts contained in it. Even when an abscess takes place on the outside of the capsular ligament, the case cannot be considered as dangerous, provided the cavity of the joint be not involved in the inflammatory attack. Every inflammation of a large joint may be deemed a case of considerable importance. I do not mean to assert, that cases in which the inflammation is mild in degree, and simple in its nature, are dangerous; no—I only wish to inculcate, that though the inflammation be originally genuine, it is always very likely to be converted into one of a specific nature, whenever there is a tendency in the system to scrofulous disorder. A person, whose constitution is scrofulous, may sometimes continue, during life, exempt from any local disease of this specific nature, provided he be fortunate enough to avoid all irritation of parts, on which scrofula is most particularly disposed to make its attack.—Among such parts we must class the joints, especially the knee, hip, elbow, and ankle. Hence, when a joint is inflamed, how mild soever the affection may be, we ought never to forget, that, when there is a tendency to scrofula in the system, the original case of simple inflammation is very apt to be the exciting cause of the white swelling, one of the most severe and intractable diseases, which increase the catalogue of human miseries.

Hence, the curative means should be most rigorously put in execution, not merely on account of an abstract view of the present state of the case; but, also, on account of the opportunity, which is now afforded for a terrible disease to arise, which often remains previously dormant.

It will considerably shorten what we have to say concerning the treatment of inflamed joints, to observe, that the antiphlogistic plan, in the full sense of the expression, is to be strictly adopted. But, as there is a variety of means often adapted to the same purpose, it seems necessary to offer a few remarks on those, which lay the greatest claim to our commendations. The treatment of an inflamed knee will serve to illustrate that of all other large joints.

There are few other surgical cases, in which general, and, especially topical bleeding is more strongly indicated.

The violence of the inflammation, and the strength, age, and pulse of the patient, must determine, with regard to the use of the lancet; but, the topical application of leeches may be said to be invariably proper. When the leeches fall off, the bleeding is to be promoted by fomenting the part. The surgeon should daily persist in this practice, until the acute stage of the inflammation has subsided. But, in conjunction with this treatment, we are to keep the joint continually surrounded with linen wet with the saturnine lotion.

In a few instances, however, the patient seems to derive more ease and benefit from the employment of fomentations and emollient poultices, and the feelings of the afflicted should always be consulted; for, if the pain be materially alleviated by this, or that application, its employment will hardly ever be wrong.

Nothing more need be said, concerning the rest of the treatment, proper during the vehemence of the inflammation, as the duty of the surgeon is not materially different from what it is in other inflammatory cases.

As soon as the acute stage of the affection has subsided, the grand object is to remove the effects which have been left. These are a thickened state of the capsular ligament, and parts surrounding the articulation; a stiffness of the joint, and pain, when it is moved; a collection of fluid in the capsule, &c. This state of the complaint, when neglected, and there is a tendency to scrofula, may prove exceedingly obstinate, and even terminate in an irremediable, specific distemper of the joint.

When this second stage of the disorder seems tardy in going off, the application of a blister is proper, and it should be kept open for a few days, by means of the savin cerate.

In other cases, in which the inflammation has been more trivial, and the effects, which it has left, are slight; lotions, composed of vinegar and the muriate of ammonia, suffice for the removal of the chronic complaints, left after the acute stage of the disorder.

The severity of the constitutional symptoms is mostly, if not always, greater, when the inflammation of a large joint arises from a wound, than when it is the consequence of a bruise, or sprain. (See *Treatise on the Diseases of the Joints*, 1807.)

The inflammation of the capsular ligament, or synovial membrane, frequently assumes the chronic form, and (as Mr. Brodie observes) it is then very often confounded with other more serious maladies, under the general appellation of white-swelling. The disease often arises from cold, and hence is more common in the knee and ankle, than in the hip, or shoulder. It may also arise from the immoderate use of mercury, and, in particular constitutions, from rheumatism and general debility of the system. In these instances, it often leaves one joint and attacks another:

and it is less severe, and less disposed to produce effusion of coagulating lymph, or a thickened state of the membrane, than when it is apparently a local disease. (*Brodie in Medico Chir. Trans. Vol.* 4, *P.* 218.)

### LOOSE CARTILAGES IN JOINTS.

Hard, roundish, or flattened bodies, mostly of a cartilaginous nature, are sometimes formed within the capsular ligaments, occasioning more or less pain in the affected joints, and a considerable impediment to the freedom of their movements. The disorder, though not spoken of, by any of the ancient writers, is far from being uncommon.

Paré is the first who speaks of it: he says, that *a hard polished, white body, of the size of an almond*, was discharged from the knee of a patient, in the year 1558, in which he had made an incision for an *aqueous aposteme*, (without doubt an hydrops articuli.) (*Liv.* 25, *chap.* 15, *P.* 772.) A hundred and thirty-three years afterwards, viz. in 1691, Pechlin published the full details of another case, in which a cartilaginous body was successfully extracted from the knee. (*Observat. Physico-med. Obs.* 38, *P*, 306.) Dr. Alexander Monro in 1726, dissected the knee joint of a woman, who had been hung, and found in the articulation a cartilaginous body, of the shape and size of a small bean. These were the only examples of the disease known before the year 1736, at which period Mr. Simson cut out of the knee a similar substance, which he supposed at the time of the operation was only beneath the skin. (See *Edinb. Med. Essays, Vol.* 4.)

Since the publication of this last case, the disease has been several times met with in England by Bromfield, Hewit, Middleton, Gooch, Ford, Home, Bell, Abernethy, &c.; in Germany, by Henckel, Theden, Loeffler, &c.; and in France, by Desault, Sabatier, and many other practitioners. Hence, as Boyer remarks, this disorder is now as well known, as most others, to which the joints are subject. (*Traité des Mal. Chir. T.* 4, *P.* 434.)

Such detached and moveable cartilages are not peculiar to the joint of the knee, they occasionally occur in other joints of the body; but they are most frequently met with in the knee, and it is in this joint that they produce symptoms which render them the object of a chirurgical operation. Morgagni and B. Bell have seen them in the ankle; Haller in the joint of the jaw; and Hey in the elbow.

These substances, in their structure, are, as Sir E. Home remarks, analogous to bone; but, in their external appearance, bear a greater resemblance to cartilage. They are not, however, always exactly of the same structure, being in some instances softer than in others. Their external surface is smooth and polished, and, being lubricated by the synovia, allows them to be moved readily from one part of the joint to another. They seldom remain long at rest, while the limb is in motion; and when they happen to be in situations where they are pressed upon with force by the different parts of the joint, they occasion considerable pain, and materially interfere with its necessary motions.

The circumstance of their being loose, and having no remains of a visible attachment, made it difficult to form conjectures respecting their formation; and according to Sir E. Home, no satisfactory account of their origin had been given, till Mr. Hunter's observations threw light upon the subject. The circumstances, which led him to the investigation of this subject, appear at first sight so foreign to the purpose, that they require some explanation.

In the course of his experiments and observations, instituted with a view to establish a living principle in the blood, Mr. Hunter was naturally induced to attend to the phenomena, which took place, when that fluid was extravasated, whether in consequence of accidental violence, or other circumstances. The first change which took place he found to be coagulation; and the coagulum thus formed, if in contact with living parts, did not produce an irritation similar to extraneous matter, nor was it absorbed and taken back into the constitution, but, in many instances, preserved its living principle, and became vascular, receiving branches from the neighbouring blood-vessels for its support; it afterwards underwent changes, rendering it similar to the parts to which it was attached, and which supplied it with nourishment.

In attending to cases of this kind, he found that where a coagulum adhered to a surface, which varied its position, adapting it to the motions of some other part; the attachment was necessarily diminished by the friction, rendering it in some instances pendulous, and in others breaking it off entirely.

Hence, it was easy to explain the mode in which those pendulous bodies are formed, which are sometimes attached to the inside of circumscribed cavities, and the principle being established, it became equally easy for Mr. Hunter, to apply it under other circumstances, since it is evident from a known law in the animal economy, that extravasated blood, when rendered an organized part of the body, can assume the nature of the parts into which it is effused, and consequently, the same coagulum which in another situation might form a soft tumour, would when situated on a bone, or in the neighbourhood of bone, often form a hard one. The cartilages found in the knee-joint, therefore, appeared to him to originate from a deposit of coagulated blood upon the end of one of the bones, which had acquired the nature of cartilage, and had afterwards been separated. This opinion was further confirmed by the examination of joints which had been violently strained, or otherwise injured, where the patients had died at different periods after the accident. In some of these there were small projecting parts, preternaturally formed, as hard as cartilage, and so situated, as to be readily knocked off by any sudden, or violent motion of the joint. (*Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol.* 1.)

Mr. Brodie met with two cases, in which the loose bodies were of a different nature, and had a different origin from those, which are ordinarily met with. Sometimes disease causes a bony ridge to be formed, like a small exostosis, round the margin of the cartilaginous surfaces of the joint. In the two examples, alluded to, this preternatural growth of bone had taken place, and in consequence of the motion of the parts, portions of it had been broken off, and lay loose in the cavity of the joint. (*Brodie in Medico Chir. Trans. Vol.* 4, *P.* 276.)

One or more of these preternatural bodies may be formed in the same joint. Sir E. Home mentions one instance in which there were three; they are commonly about the size of a horse-bean, often much smaller, and sometimes considerably larger; when very large, they do not give so much trouble to the patient as the smaller kind. A soldier in the 56th regiment has one nearly as big as the patella, which occasions little uneasiness, being too large to insinuate itself into the moving parts of the joint. Morgagni saw twenty-five in the left knee of an old woman, who died of apoplexy; and Haller met with no less, than twenty, in the articulation of the lower jaw. When there are several in the same joint, it is observed, that their size is generally small. (*Boyer's Traité des Mal. Chir. T.* 4, *P.* 436.)

The diagnosis of this disease, as Boyer observes, is seldom attended with any difficulty. When the formation of the extraneous substances follows a fall, or blow, upon the joint, the complaint begins with a swelling of the surrounding soft parts, and upon the subsidence of this swelling, which lasts for a time more or less long, the presence of the little cartilaginous tumours is indicated by certain symptoms, which are peculiar to them. In persons, who have had no blow, nor fall upon the knee, the disease sometimes commences with a more or less acute pain in the joint, with, or without swelling of the surrounding soft parts, and which affection is usually regarded as rheumatism. To these first symptoms which are common to foreign bodies in the joints, and other diseases of these parts, are soon added other particular signs, by which the nature of the case is evinced.

As the extraneous bodies are in general free and moveable in the joint, they can easily be made to slip about from one part of the articulation to another: a circumstance, which is facilitated by the smoothness of their surface, as well as by the synovia, which is mostly in larger quantity, than natural. According to the situation, which they happen to occupy, sometimes they produce acute pain; sometimes no pain whatever. When they lodge in a depression, where they are not compressed, they cause no pain; and if they could be always kept in this position, their presence would not be likely to excite any inconveniences. But, when they get between the articular surfaces, which in certain postures of the limb come into contact with each other, the following are the effects of the compression. Sometimes, the extraneous substance suddenly glides between the condyles of the thigh bone and head of the tibia, and, while it lodges there, excites acute pain in certain directions of the limb, and instantaneous loss of the power of moving the knee. But, when it shifts its place again, either naturally, or accidentally, during an examination of the affected part, the compression is removed, the pain all at once ceases, and the functions of the joint are as suddenly restored. Most frequently, when the extraneous body gets behind the patella, or the ligament of the patella, as the patient is walking, he is compelled to make a sudden stop, and would fall down from the acuteness of the pain, if nothing were at hand to save him. Some patients have been observed, however, who experienced no pain in these circumstances. Reimarus mentions a man, who suffered great pain and could not move his leg, when the extraneous body was at the side of the joint; but was immediately relieved by pushing it under the patella. B. Bell states, that he has seen cases, in which the pain was so violent at the instant when the patients put the leg in certain postures that fainting was brought on, and they were so afraid of a return of the suffering, that they preferred remaining perfectly quiet to running any risk of causing the pain again. He even asserts, that he has known some persons, in whom the least motion of the limb would cause such pain as awoke them out of the deepest sleep. The pain, excited by the situation of the extraneous body betwixt the articular surfaces, recurs at intervals more or less long, and always in consequence of some motion, or exertion. Sometimes it ceases directly by the effect of a movement, contrary to that, which produced it; but, most frequently it continues, and then the surrounding soft parts are affected with swelling, which obliges the patient to keep his bed, and have recourse to emollient anodyne applications. Sometimes, as I have already noticed, the foreign body lies at a part of the joint, where it causes no inconvenience, and makes no pressure on the articular surfaces. In this case, all the symptoms have been known to cease for several months, so that the patient imagined himself cured, when, suddenly, the foreign body was urged by some effort into another situation, where it occasioned a renewal of all the former pain.

The foregoing circumstances afford strong presumptive evidence of the presence of extraneous cartilaginous substances in the joint; but, they do not amount to certainty: this can only be acquired by the touch. In handling the knee of the patient, the surgeon feels a hard, prominent substance, which slips about under his fingers, and glides under the patella, or the ligament of this bone, and sometimes under the tendon of the extensor muscles of the leg, from one side of the joint to the other. The extraneous body may make its appearance either at the inside or the outside of the articulation; but, it most frequently presents itself at the former part, which is the broadest and most sloping, while the capsular ligament there is loosest. Desault met with one instance, in which the capsular ligament and soft parts were so loose, that the patient could turn the extraneous substance round and round.

In general, the complaint is not dangerous; but, as it is painful, and impedes, or often prevents walking; and usually can be cured only by an operation, which has sometimes had fatal consequences; we cannot be too much upon our guard in delivering a prognosis.

It is only in the knee, that the disease ever becomes so troublesome as to require an operation, or, indeed, any surgical treatment.

If we except making an incision into the joint, for the purpose of extracting the cartilaginous tumours, we are not acquainted with any certain means of freeing a patient from the inconvenience of the complaint. To this plan, the danger attendant on all wounds of so large an articulation as the knee, is a very serious objection. Middleton and Gooch endeavoured to conduct the extraneous body into a situation, where it produced no pain, and to retain it in that position, a long time by bandages, under the idea, that the cartilaginous substance would adhere to the contiguous parts, and occasion no future trouble. Some will be inclined to think, that no positive conclusion ought to be drawn from the cases brought forward by these gentlemen, because they had no opportunity of seeing their patients again at the end of a reasonable length of time, and we know, that loose cartilages in the joints, sometimes disappear for half a year, and then make their appearance again. Yet, perhaps, the very circumstance of the patients not applying again, may appear to many to justify the inference, that sufficient relief had been obtained.

However, it should not be concealed, that this method was also tried in St. George's Hospital without benefit, and that in one case, the pain was increased by it. (See *Reimarus de Fungo Articulorum*, § 27, 54, *&c.*)

Mr. Hey, impressed with a just sense of the dangerous symptoms, which have occasionally resulted from the most simple wounds penetrating the knee-joint, was induced to try the efficacy of a laced knee-cap, and the cases, which he has adduced, clearly demonstrate, that the benefit thus obtained, is not temporary, at least, as long as the patient continues to wear the bandage. In one case, the method had been tried for ten years, with all the success, which the patient could desire. Boyer also made one patient use a knee-cap for a year; after which it was left off, the patient appearing cured. And, in a second instance, the same practitioner tried the plan, which put a stop to the pain, and enabled the patient to walk with ease; but, it was not known whether the method was properly continued, as the patient had not latterly been seen. (*Boyer's Traité des Mal. Chir. T.* 4, *P.* 444.)

Contemplating the evidence, which we have upon this point, and the perilous symptoms, sometimes following wounds of the knee-joint, I am decidedly of opinion, that the effect of a knee-cap, or of a roller and compress, applied over the loose cartilage, ought generally to be tried, before having recourse to excision. I say generally, because the conduct of the surgeon ought, in such cases, to be adapted to the condition, and inclination of the patient. If a man be deprived of his livelihood, by not being able to use his knee; if he cannot, or will not take the trouble of wearing a bandage; if he be urgently desirous of running the risk of the operation after things have been impartially explained to him; if a bandage should not be productive of sufficient relief; and, lastly, if excessive pain, severe inflammation of the joint, and lameness, should frequently be produced by the complaint; I think it is the duty of a surgeon to operate. It is very certain, that success has generally attended the operation; but, small as the chance is of losing the limb, and even life, in the attempt to get rid of the disease; yet, since the inconveniences of the complaint are, in most cases, very bearable, and are even capable of palliation by means of a bandage, endangering the limb and life in any degree, must seem to many persons contrary to the dictates of prudence. At all events, we must agree with Boyer, that, as a laced knee-cap can do no harm, we ought always to make trial of it, and never perform the operation except when pressure does not answer, and the return of frequent and violent pain makes the employment of the knife necessary. (See *Traité des Mal. Chir. T.* 4, *p.* 445.)

I am ready to allow, with M. Brochier, that the danger, attendant on wounds of the large joints, has always been exaggerated in consequence of ancient prejudices. (*Desault's Journal, Vol.* 2.) But, making every allowance for the influence of prejudice, a man must be very sceptical indeed, who does not consider the wound of so large a joint as the knee, attended with real cause for the apprehension of danger. See Case 2, in my *Treatise on the Diseases of the Joints.* At the end of Mr. Ford's case, (*Med. Obs. and Inquiries, Vol.* 5.) we read on the subject of cutting loose cartilages out of the knee: "The society have been informed of several cases, in which the operation has been performed; some, like this, have healed up, without any trouble; others have been followed by violent inflammation, fever, and death itself."

As the disorder is often attended with a degree of heat and tenderness in the articulation; as the danger of the operation is, in a great measure, proportioned to the subsequent inflammation; and, as much of the danger is at once removed, if the wound unite by the first intention; the advice, to keep the patient in bed, a few days before operating, to apply leeches, and cold saturnine lotions to the knee during the same time, and to exhibit beforehand a saline purgative, is highly prudent.

I shall next introduce an account of the plan of operating, as described by several of the best modern surgeons.

"As these loose bodies cannot always be found, no time can be fixed for the operation; but the patient, who will soon become familiar with his own complaint, must arrest them when in a favourable situation, and retain them there till the surgeon can be sent for.

"Before the operation, the limb should be extended upon a table in an horizontal position, and secured by means of assistants; the loose cartilages are to be pushed into the upper part of the joint above the patella, and then to one side; the inner side is to be preferred, as in that situation only the vastus internus muscle will be divided in the operation. Should there be several of these bodies, they must be all secured, or the operation should be postponed till some more favourable opportunity, since the leaving of one will subject the patient to the repetition of an operation, not only painful, but attended with some degree of danger.

"The loose bodies are to be secured in the situation above-mentioned by an assistant, a task not easily performed while they are cut upon, from their being lubricated by the synovia; and if allowed to escape into the general cavity, they may not readily, if at all, be brought back into the same situation.

"The operation consists in making an incision upon the loose cartilage, which it will be best to do in the direction of the thigh, as the wound will more readily be healed by the first intention. If the skin is drawn to one side, previously to making the incision, the wound through the parts underneath will not correspond with that made in the skin, which circumstance will favour their union. The incision upon the cartilage must be made with caution, as it will with difficulty be retained in its situation if much force is applied. The assistant is to endeavour to push the loose body through the opening, which must be made sufficiently large for that purpose; but as this cannot always be done, the broad end of an eyed probe may be passed under it, so as to lift it out, or a sharp-pointed instrument may be stuck into it, which will fix it to its situation, and bring it more within the management of the surgeon.

"The cartilages being all extracted, the cut edges of the wound are to be brought together, and, by means of a compress of lint, not only pressed close to one another, but also to the parts underneath, in which situation they are to be retained by sticking plaster, and the uniting bandage.

"As union by the first intention is of the utmost consequence after this operation, to prevent an inflammation of the joint, the patient should remain in bed with the leg extended, till the wound is perfectly united, or at least all chance of inflammation at an end." (*Home, in Trans. of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol.* 1, *p.* 239, *&c.*)

In one instance, Desault proceeded in the following manner: the surgeon, after relaxing the capsular ligament by extending the leg, brought the extraneous body on the inside of the articulation against the attachment of the capsular ligament, and secured it in this situation, between the index finger and thumb of the left hand, whilst an assistant drew the integuments forwards towards the patella. All the parts that covered this extraneous body were now divided by a longitudinal incision, one inch in length, and its extraction accomplished by pushing it from above downwards, and raising it inferiorly with the end of the knife. This substance, on examination, was found similar in colour to the cartilages that cover the articular surfaces: it was three quarters of an inch in length, six lines and a half in width, and three lines in thickness; its surfaces were smooth, one concave and the other convex; its circumference irregular, disseminated with red points, forming small depressions; the inside was ossified, the outside of a cartilaginous texture. As soon as the substance was extracted, the assistant let go the integuments which he had drawn forwards; they consequently returned to their natural situation, on the inner side of the knee-joint, in such a manner, that the external wound in the integuments was situated more inward than the one in the capsular ligament. Two advantages were procured by this means: on the one hand, air was prevented from penetrating into the articulation; and on the other, the floating portion of capsular ligament, retained inwards by the skin, was more likely to attach itself to the condyle, in case it did not unite to the other portion of the capsule divided near its attachment. The edges of the wound were brought into contact by means of a uniting bandage; dry lint and compresses were applied, and retained on the part by a slight bandage; the limb was kept in a state of extension. (*Desault's Plan, as described by Brochier in Desault's Journal, Tom.* 2.) It is observed, by Mr. Abernethy, that the inner surface of the internal condyle of the os femoris presents an extensive and nearly a plain surface, which terminates in front and at its upper part by an edge which forms a portion of a circle. If the points of the finger be firmly pressed upon this edge so as to form a kind of line of circumvallation round these (cartilaginous) bodies, they cannot pass into the joint in this direction, nor can they recede in any other, on account of the tense state of the internal lateral ligament. Here these substances are near the surface, and may be distinctly felt; and there is nothing to be divided in order to expose them, but the integuments, fascia, and the capsule of the joint.

In an interesting case, which Mr. Abernethy relates, he observes: "The operation was done in the following manner. Sir Charles Blicke, who assisted me, pressed the integuments of the knee, gently towards the internal condyle, and then applied his fingers in the manner I have described, round the circular edge of the bone. I also drew the integuments gently towards the inner ham-string, and divided them longitudinally, immediately over the loose substance, to the extent of an inch and an half. This withdrawing of the integuments from their natural situation was designed to prevent a direct correspondence in the situation of the external wound, and that of the capsule of the joint: for when the integuments were suffered to regain their natural position, the wound in them was nearer to the patella, than the wound which was made in the capsule. The fascia which covers the joint being exposed by the division of the integuments, it was divided in a similar direction, and nearly to the same extent. The capsule was now laid bare, and I gently divided it to the extent of half an inch, where it covered one of the hard substances, which suddenly slipped through the opening, and by pressing gently upon the other, it also came through at the same part. The bodies which were thus removed, were about three quarters of an inch in length, and half an inch in breadth. They had a highly polished surface, and were hard like cartilage. The fluid contained in the joint was pressed toward the wound, and about two ounces of synovia were discharged. I then drew the wound of the integuments gently towards the patella, pressed the two sides together, and closed it accurately with sticking plaster, enjoining the patient to keep the limb as free from motion as possible." (*Surgical Observations,* 1804.)

When there are several extraneous cartilaginous bodies in the joint operated upon, the surgeon ought to extract them all through the same wound, if it can be done without producing too much irritation of the capsular ligament, and they will admit of it. But, frequently, one only can be made to present itself at a time, or can be easily got through the opening. Each little tumor will then require a separate operation, which is a far safer plan, than disturbing the part by long and repeated attempts to extract them all at once. (See *Boyer's Traité des Malad. Chir. T.* 4, *p.* 448.) The surgeon is also often obliged to make his incision at a particular point, because at no other can the extraneous substance be fixed. A case confirming all these latter observations has been recently published by Dr. Clarke. (See *Medico-Chirurgical Trans. Vol.* 5, *p.* 67.) In this instance, the operation was thrice performed upon the same knee-joint, with perfect success: a circumstance, I believe, without a parallel.

On the preceding subject some observations and two successful operations have been lately published by M. Larrey. (See *Mémoires de Chirurgie Militaire, tom.* 2. *p.* 421, *&c.*) With the exception of a few wrong theories, he appears to have given a very fair account of the disease.

### HYDROPS ARTICULI.

This signifies a collection of serous fluid in the capsular ligament of a joint. The knee is more subject, than other joints, to dropsical disease, which has, however, been known to affect the wrist, ankle, and shoulder joints. (See *Boyer's Traité des Mal. Chir. Tom.* 4, *p.* 456.)

Mr. Russell has adopted the opinion, that some cases of this kind are venereal, and others scrophulous; but, he has not supported the doctrine on any solid foundation. Hydrops articuli generally arises from contusions, rheumatism, sprains, exposure to severe cold, the presence of extraneous cartilaginous bodies in the joint, and in general from any thing, which irritates the capsular ligament, and brings on a slow chronic inflammation of it. The complaint also sometimes follows fevers; but, in most instances, it is purely a local affection, quite independent of general debility. (*Boyer, T.* 4, *p.* 467.)

Hydrops articuli presents itself in the form of a soft tumour; circumscribed by the attachments of the capsular ligament; without change of colour in the skin; accompanied with a fluctuation; it is indolent, and very little painful; causing hardly any impediment to the motion of the joint; yielding to the pressure of the finger, but not retaining any impression, as in œdema. The swelling does not occupy equally every side of the joint, being most conspicuous where the capsular ligament is loose and superficial. In the wrist, it occurs at the anterior and posterior parts of the joint, but, especially, in the former situation, while it is scarcely perceptible at the sides. In the ankle, it is more apparent in front of the malleoli, than any where else; and, in the shoulder, it does not surround the joint, but is almost always confined to the forepart of it, and can only be seen in the interspace between the deltoid and great pectoral muscles.

In the knee joint, which is the common situation of hydrops articuli, the tumour does not occur behind the articulation; but at the front and sides. Behind, the capsular ligament is too narrow to admit of being much distended with the synovia; while, in front and laterally, it is broad, so that it can there yield considerably in proportion as the quantity of fluid increases. The swelling is at first circumscribed by the attachments of the capsular ligament; but, in consequence of the accumulation of fluid, it afterwards exceeds these limits above, and spreads more or less upward between the thigh bone and the extensor muscles of the leg, which are lifted up by it. Boyer has seen it reach to the upper third of the thigh. The swelling is irregular in shape: it is most prominent, where the capsular ligament is wide and loose, and it is in some measure divided longitudinally into two lateral portions, by the patella, the ligament of the patella, and the tendon of the extensor muscles of the leg, all which parts the synovia raises, and pushes forward, though in a much less degree, than the capsular ligament. Of these lateral portions, the internal is broadest and most prominent, because the part of the capsule between the patella and edge of the internal condyle being larger, than that situated between the patella and edge of the external condyle, yields in a greater degree to the distending fluid. The motions of the leg, which are generally little interrupted by this disease, make a difference in the shape and consistence of the swelling. In flexion, the tumour becomes harder, more tense, and broader, and more prominent at the sides of the knee-pan, which is somewhat depressed by its ligament. In extension, the tumour is rendered softer, and the fluctuation plainer.

In order to feel distinctly the fluctuation, which is one of the best symptoms of the disease, the ends of two or three fingers should be placed on one side of the swelling, while the opposite side is to be struck with the end of the middle finger of the other hand.

The patella, being pushed forward, away from the articular pulley, is very moveable, and, as it were, floating. When it is pressed backward, while the leg is extended, it can be felt to move a certain way, before it meets with the resistance of the articular pulley. And on the pressure being discontinued, it immediately separates from this part again.

By such symptoms, hydrops articuli may easily be distinguished from white swellings, from tumours of the bursa mucosa under the extensor tendons of the leg; from ganglions in front of the knee-pan; from rheumatism; œdema, &c.

The prognosis of hydrops articuli is the most favourable, when the swelling is recent and small, and has been quick in its progress. On the contrary, when the tumour is of long standing and large; the effused fluid thick and viscid; and the synovial membrane thickened; there is hardly any hope of a cure by absorption. The worst case is that which is complicated with disease of the ligaments, cartilages, and bones, or in other words, with white swelling.

The cure of the above described dropsical affection of the joints, depends upon the absorption of the effused fluid. Such absorption is sometimes altogether spontaneous, and it may be excited, and promoted, by mere friction, by rubbing the joint with camphorated mercurial ointment, by repeatedly applying leeches, and particularly, by the employment of a perpetual blister.

The operation of a blister may always be very materially assisted by a bandage, applied with moderate tightness. Among other effectual means of cure, we may enumerate frictions with flannel impregnated with the fumes of vinegar; electricity; and the exhibition of mercurial medicines to open the bowels. When hydrops articuli occurs during the debility, consequent to typhoid, and other fevers, the complaint can hardly be expected to get well before the patient has regained some degree of strength.

As, however, hydrops articuli is generally quite a local disease, Boyer contends, that it should be chiefly treated with topical remedies; and he sets down diuretics, sudorifics, hydragogues, &c. as improper or inefficient. (*Op. cit. p.* 467.) He is strongly in favour of repeated blisters both for the prevention and cure of the disease.

Circumstances do not often justify making an opening into the joint; but, excessive distention, in some neglected cases, might certainly be an urgent reason for performing such an operation. Also, if the complaint should resist all other plans of treatment, and the irritation of the tumour greatly impair a weak constitution, the practice would be justifiable. An interesting example of this kind is related by Mr. Latta. (*System of Surgery, Vol.* 2, *p.* 490.)

It is best to make the opening in such a way, that the wound in the capsular ligament after the operation, will not remain directly opposite the wound in the skin. For this purpose, the integuments are to be pushed to one side, before the surgeon makes an incision through them. (*Encyclopédie Méthod. Part. Chir. Art. Hydropisie des Jointures.*)

The operation is not always successful, being sometimes followed by alarming symptoms, which either end fatally, or occasion a necessity for amputation. The fluid also generally collects again, and as the synovial membrane is mostly thickened, it often inflames, and suppuration in the joint ensues. Hence, when hydrops articuli originates from rheumatism; when it is recent, indolent, and not large; and when it does not seriously impair the functions of the joint; Boyer recommends the operation not to be done. But, he sanctions its performance, when the disease is combined with extraneous cartilaginous bodies in the joint; or when it is very considerable, attended with severe pain, and impairment of the functions of the joint. (*Op. cit. T.* 4, *p.* 473.)

### COLLECTIONS OF BLOOD IN JOINTS.

Most systematic writers speak of this kind of case, though it is certainly uncommon. Tumours, about the joints, composed of blood, and set down in numerous surgical works, as extravasations within the capsular ligaments, are generally on the outside of them.

Certainly, were a collection of fluid to take place in a joint very suddenly, after a sprain, or contusion, and to continue to increase gradually, for some time afterwards, there would be reason for believing, that most of the contents of the tumour was blood. The production of an abscess, and the secretion of any fluid, would have required a longer time.

Were blood known to be undoubtedly effused in a large articulation, no man would be justified in making an opening for its discharge. No bad symptoms are likely to result from its mere presence, and the absorbents will, in the end, take it away. Should an incision be made into the joint, the coagulated state of the extravasated blood would frequently not allow such blood to be discharged.

The best plan is to apply discutient remedies; a lotion of vinegar and sal ammoniac is the best application for the first three or four days, and afterwards, frictions with camphorated liniments may be safely had recourse to.

Mr. Hey has related a case, in which the knee-joint was wounded, and blood insinuated itself into the capsular ligament; yet, though the occurrence could not be hindered, no harm resulted from the extravasation, which was absorbed, without having created the smallest inconvenience. (*Practical Observations in Surgery, p.* 354.)

### WHITE SWELLING.

The white swelling, or spina ventosa, as it is not unfrequently called, in imitation of the Arabian writers, Rhazes and Avicenna, is, in this country, a peculiarly common, and an exceedingly terrible disease. As I have stated in my *Treatise on the Diseases of the Joints,* the people of the continent are, unquestionably, as subject as we are, to chronic enlargements of the knee-joint. Foreign surgeons describe numerous varieties of a disease, which many English surgeons would term, *rheumatic white swellings;* but, they acknowledge, that the scrophulous species of this disorder does not commonly occur to their notice. (*Kortum de Vitio Scrophuloso, Vol.* 2. *p.* 333. *Brambilla in Acta Acad. Med. Chir. Vindobonensis, Vol.* 1. *p.* 20. *Petit sur les Maladies des Os, Vol.* 2. *p.* 359. *Edit.* 1749.)

Wiseman was the first who used the term White-Swelling; and the expression is not very unapt, because it conveys an idea of one mark of the distemper, which is, that notwithstanding the increase of size in the joint, the skin is not inflamed, but retains its natural colour. (*Pott.*)

The varieties of white-swellings are very numerous, and might usefully receive particular appellations. Systematic writers have generally been content with a distinction into two kinds, viz. *rheumatic*, and *scrophulous.*

The last species of the disease they also distinguish into such tumours as primarily affect the bones, and then the ligaments and soft parts; and into other cases in which the ligaments and soft parts become diseased, before there is any morbid affection of the bones.

Mr. Brodie has endeavoured to form a more correct classification of the different complaints, to which the term white-swelling is applied; and his descriptions are valuable, because confirmed by extensive observation, and numerous dissections.

1. "Inflammation of the synovial membranes (says Mr. Brodie) may occur as a symptom of a constitutional disease, where the system is affected by rheumatism; where mercury has been exhibited improperly, or in large quantities, or where there is general debility from any other cause. But, in these cases, the inflammation is seldom severe; it occasions an effusion of fluid into the joint, but rarely terminates in the extravasation of coagulable lymph or thickening of the inflamed membrane. Sometimes it leaves one joint to attack another, or it suddenly subsides without another joint becoming affected.

"At other times, the inflammation occurs as a local affection, produced by a sprain, the application of cold, or arising from no evident cause. It is here for the most part more severe and of longer duration; it leaves the joint with its functions more or less impaired, and occasionally terminates in its total destruction. In itself it is a serious disease; but, it is often confounded, under the general name of white swelling, with other diseases, still more serious. In some cases, it assumes the form of an acute; but, in the greater number of instances, it has that of a chronic inflammation." (*Brodie in Medico-Chir. Trans. Vol.* 5, *p.* 240.)

When the case is acute, the skin is in general red, and the joint tender and painful. The pain, which is not confined to any particular point, and is aggravated by motion of the limb, is soon followed by swelling. The patient is also affected with inflammatory fever. In a few days, the disease either subsides altogether, or assumes the chronic form.

When the inflammation is chronic, the pain and tenderness are less, so that the patient is able to walk about, and often without experiencing any severe distress. There is no fever, and the skin retains its natural colour. The swelling increases also less rapidly, than in acute cases. These symptoms are generally rendered worse by exposure to cold and exertions. "In the first instance the swelling of the joint arises entirely from a preternatural quantity of synovia. But, when the inflammation has existed some time, the fluid is not so plainly perceptible, because the synovial membrane is now thickened, which likewise augments the stiffness of the articulation. The shape of the swelling is not that of the articulating ends of the bones, but arises chiefly from the distended state of the synovial membrane, and hence depends in a great measure on the situation of the ligaments and tendons, which resist it in certain directions. Thus, when the knee is affected, the swelling is principally observable in the places explained in speaking of Hydrops Articuli.

After the inflammation of the synovial membrane has subsided, the fluid is absorbed, and, in some instances, the joint regains its natural figure and mobility; but, in the majority of cases, stiffness and swelling remain. Whenever the patient is exposed to cold, or exercises the limb much, the pain returns and the swelling is increased. Such cases are of frequent occurrence, and form a large proportion of those, which are called white-swellings.

Long continued and neglected inflammation of the synovial membrane sometimes terminates in the formation of an abscess in the joint, in ulceration of the cartilages, and destruction of the articular surfaces. (See *Brodie's Obs. in Medico-Chir. Trans. Vol.* 5, *p.* 240, *&c.*)

2. Mr. Brodie has particularly described certain cases, where the disease originates in the synovial membrane, which loses its natural organization, and becomes converted into a thick, pulpy substance, of a light brown colour, intersected by white membranous lines, and from $\frac{1}{4}$ to $\frac{1}{2}$ of an inch or more in thickness. As this disease advances, it involves all the parts of which the joint is composed, producing ulceration of the cartilages, caries of the bones, wasting of the ligaments, and abscesses in different places. The complaint has invariably proved slow in its progress, and sometimes has remained nearly in an indolent state for many months, or even for one or two years; but (says Mr. Brodie) "I have never met with an instance, in which a real amendment was produced; much less have I known any, in which a cure was effected." (See *Medico-Chir. Trans. Vol.* 4, *p.* 220, *&c.*) This gentleman further acquaints us, that the preceding affection of the synovial membrane is rarely met with, except in the knee, and that it generally takes place in young persons, under, or not much above the age of puberty. "In the origin of this disease, there is a slight degree of stiffness and tumefaction, without pain, and producing only the most trifling inconvenience. These symptoms gradually increase. At last the joint scarcely admits of the smallest motion, the stiffness being greater than where it is the consequence of simple inflammation. The form of the

swelling bears some resemblance to that in cases of inflammation of the synovial membrane; but it is less regular. The swelling is soft and elastic, and gives to the hand a sensation as if it contained fluid. If only one hand be employed in making the examination, the deception may be complete, and the most experienced surgeon may be led to suppose, there is a fluid in the joint when there is none; but, if both hands be employed, one on each side, the absence of fluid is distinguished by the want of fluctuation.

"The patient experiences little, or no pain, until abscesses begin to form, and the cartilages ulcerate; and even then the pain is not so severe, as where the ulceration of the cartilages occurs, as a primary disease, and the abscesses heal more readily, and discharge a smaller quantity of pus, than in cases of this last description. At this period, the patient becomes affected with hectic fever; loses his flesh, and gradually sinks, unless the limb be removed by an operation." —(*Brodie, in Medico-Chir. Trans. Vol.* 5, *p.* 251—252.)

3. Ulceration of the articular cartilages takes place in the advanced stage of several diseases of the joints, and it also exists in many instances as a primary affection, in the early stage of which the bones, synovial membrane, and ligaments are in a natural state; but which, if neglected, ultimately occasions the entire destruction of the articulation. When the ulceration of the cartilage occurs in the superficial joints, it constitutes one of the diseases, which have been known by the name of white swelling. From cases, which Mr. Brodie has met with, he is led to conclude, that when it takes place in the hip, it is this disease, which has been variously designated by writers, the "*morbus coxarius*," the "Disease of the Hip," the "Scrophulous Hip," the "Scrophulous Caries of the Hip-Joint." At least, says Mr. Brodie, it is to this disease, that these names have been principally applied, though probably other morbid affections have been occasionally confounded with it. (*Op. cit. Vol.* 4, *p.* 236.) The ulceration of the articular cartilages takes place, as a primary disease, chiefly in children, or adults under the middle age. "Of sixty-eight persons affected with this disease, fifty-six (according to Mr. Brodie) were under thirty years of age: the youngest was an infant of about twelve months; the oldest was a woman of sixty. As the knee is more frequently affected by inflammation of the synovial membrane, so is the hip more liable, than other joints, to the ulceration of the cartilaginous surfaces. In general the disease is confined to a single joint; but, it is not very unusual to find two or three joints affected in the same individual, either at the same time, or in succession. Sometimes, the patient traces the beginning of his symptoms to a local injury, or to his having been exposed to cold; but, for the most part, no cause can be assigned for the complaint." (See *Medico-Chirurg. Trans. Vol.* 6, *p.* 319.)

The symptoms of the disease of the hip-joint will be described in the ensuing section, and we shall here confine our remarks to the symptoms characterizing ulceration of the cartilages of the knee, as pointed out by Mr. Brodie. They differ from those of inflammation of the synovial membrane, by the pain being slight in the beginning, and gradually becoming very intense, which is the reverse of what happens in the latter affection. The pain also in the commencement is unattended with any evident swelling, which never comes on in less than four or five weeks, and often not till after several months. It is not to be inferred, however, that every slight pain of the joint unaccompanied with swelling, must of course arise from ulceration of the cartilages. But, says Mr. Brodie, when the pain continues to increase, and at last is very severe; when it is aggravated by the motion of the bones on each other, and when, after a time, a slight tumefaction of the joint takes place, we may conclude that the disease consists in such ulceration. The swelling arises from a slight inflammation of the cellular membrane on the outside of the joint; it has the form of the articulating ends of the bones; and for the most part it appears greater, than it really is, in consequence of the muscles being wasted. No fluctuation is perceptible, as where the synovial membrane is inflamed; nor is there the peculiar elasticity, which exists, where the synovial membrane has undergone a morbid alteration of its structure.

Mr. Brodie, however, has explained, that in some cases, the swelling has a different shape, and communicates the feel of a fluctuation. This happens, when inflammation of the synovial membrane, attended with a collection of the synovia of the joint, or abscesses in the surrounding soft parts, or in the articulation itself, occur as secondary diseases. When there has been considerable destruction of the soft parts from abscesses and ulceration, the head of the tibia may become dislocated and drawn towards the ham. (See *Medico-Chir. Trans. Vol.* 6, *p.* 326, *&c.*)

4. I shall pass over ulceration of the synovial membrane, which Mr. Brodie considers in a separate section, and now proceed to the scrophulous white swelling. In the scrophulous disease of the joints, the bones are primarily affected, in consequence of which, ulceration takes place in the cartilages covering their articular extremities. The cartilages being ulcerated, the subsequent progress of the disease (says Mr. Brodie) is the same as where

this ulceration takes place in the first instance. (*Medico-Chir. Trans. Vol.* 4, *p.* 266.)

It is still a very common notion, that, in white swellings, the heads of the bones are always enlarged. Mr. Russell, I believe, is the first writer who expressed an opposite sentiment, and he distinctly declares, *that he had never heard, nor known of an instance, in which the tibia was enlarged from an attack of white swelling.* (*P.* 37.) The inaccuracy of the opinion was afterwards pointed out by Mr. Lawrence, to the late Mr. Crowther, and the subject was mentioned in the first edition of the " First Lines of the Practice of Surgery."

Deceived by the feel of many diseased joints, and influenced by general opinion, I once imbibed the idea, that there was generally a regular expansion of the heads of scrophulous bones. But, excepting an occasional enlargement, which arises from spiculæ of bony matter, deposited on the outside of the tibia, ulna, &c. and which alteration cannot be called an expansion of those bones, I never until lately, saw the head of a bone enlarged, in consequence of the disease known by the name of white swelling. I was formerly much in the habit of inspecting the state of the numerous diseased joints, which were every year amputated at St. Bartholomew's Hospital, and though I was long attentive to this point, my searches after a really enlarged scrophulous bone always proved in vain. Nor was there at that period any specimen of an expanded head of a scrophulous bone in Mr. Abernethy's museum. Within the last few years, however, a specimen of an enlargement of the upper head of the ulna has been found, and it was a short time ago shewn to me by Mr. Stanley. I have also heard of a few other instances, in which the heads of the bones were actually enlarged in cases of white swelling. However, I believe the occurrence is far from being usual; nor have I yet seen in any museum or dissecting room the head of the tibia, or the condyles of the thigh bone expanded. The change, which the head of the tibia undergoes in many cases, is first a partial absorption of the phosphate of lime throughout its texture, while a softkind of matter seems to be secreted into its substance. In a more advanced stage, and, indeed, in that stage, which most frequently takes place before a joint is amputated, the head of the bone has deep excavations in consequence of caries, and its structure is now so softened, that when an instrument is pushed against the carious part, it easily penetrates deeply into the bone.

According to a modern writer, "The morbid affection appears to have its origin in the bones, which become preternaturally vascular, and contain a less than usual quantity of earthy matter, while, at first, a transparent fluid, and afterwards a yellow cheesy substance, is deposited in their cancelli. From the diseased bone, vessels, carrying red blood, shoot into the cartilage, which afterwards ulcerates in spots, the ulceration beginning on that surface, which is connected to the bone." (*Brodie in Medico-Chir. Trans. Vol.* 4, *p.* 272.)

A cursory examination of a diseased joint, even when it is cut open, will not suffice to shew, that the heads of the bones have not acquired an increase of size. In making a dissection of this kind, in the presence of a medical friend, I found that, even after the joint had been opened, the swelling had every appearance of arising from an actual expansion of the bones. The gentleman with me felt the ends of the bones after the integuments had been removed, and he coincided with me, that the feel, which was even now communicated, seemed to be caused by a swelling of the bones themselves. But, on cleaning them, the enlargement was demonstrated to arise entirely from a thickening of the soft parts. So unusual, indeed, is the expansion of the heads of the bones, that the late Mr. Crowther, who paid great attention to these cases, joined Mr. Russell in believing, that such a change never happened: a conclusion not entirely correct. (See *Practical Observations on White Swelling, &c. Edit.* 2. *p.* 14, 1808.)

Mr. Russell has particularly noticed how much the soft parts frequently contribute to the swelling. He describes the appearances on dissection thus: "The great mass of the swelling appears to arise from an affection of the parts, exterior to the cavity of the joint, and which, besides an enlargement in size, seem also to have undergone a material change in structure. There is a larger, than natural, proportion of a viscid fluid, intermixed with the cellular substance; and the cellular substance itself has become thicker, softer, and of a less firm consistence, than in a state of health." (*On the Morbid Affections of the Knee*, *p.* 30.) The manner, in which the soft parts are affected, is also described by Mr. Brodie: " Inflammation takes place of the cellular membrane, external to the joint. Serum and afterwards coagulable lymph, are effused, and hence, arises a puffy elastic swelling in the early, and an œdematous swelling in the advanced stage of the disease.

" Scrophula attacks only those bones, or portions of bones, which have a spongy texture, as the extremities of the cylindrical bones, and the bones of the carpus and tarsus; and hence, the joints become affected from their contiguity to the parts, which are the original seat of the disease." (See *Medico-Chir. Trans. Vol.* 4, *p.* 273.)

In the cavity of the joint, we sometimes find a quantity of curdy matter, and the cartilages absorbed in various places, but, more particularly round the edges of the articular surfaces.

As the name of the disease implies, the skin is not at all altered in colour. In some instances the swelling yields in a certain degree to pressure; but it never pits, and is almost always sufficiently firm to make an uninformed examiner believe, that the bones contribute to the tumour. The pain is sometimes vehement from the very first; in other instances there is hardly the least pain in the beginning of the disease. In the majority of scrophulous white-swellings, let the pain be trivial, or violent, it is particularly situated in one part of the joint; viz. either the centre of the articulation, or the head of the tibia. Sometimes, the pain continues without interruption; sometimes there are intermissions; and, in other instances, the pain recurs at regular times, so as to have been called by some writers, periodical. Almost all authors describe the patient, as suffering more uneasiness in the diseased part, when he is warm, and, particularly, when he is in this condition in bed.

At the commencement of the disease, in the majority of instances, the swelling is very inconsiderable, or there is even no visible enlargement whatever. In the little depressions, naturally situated on each side of the patella, a fulness first shews itself, and gradually spreads all over the affected joint.

The patient, unable to bear the weight of his body on the disordered joint, in consequence of the great increase of pain, thus created, gets into the habit of only touching the ground with his toes, and the knee being generally kept a little bent in this manner, soon loses the capacity of becoming completely extended again. When white-swellings have lasted a good while, the knee is almost always found in a permanent state of flexion. In scrophulous cases, pain constantly precedes any appearance of swelling; but the interval between the two symptoms differs very much in different subjects.

The morbid joint, in the course of time, acquires a vast magnitude. Still the integuments retain their natural colour, and remain unaffected. The enlargement of the articulation, however, always seems greater than it really is, in consequence of the emaciation of the limb both above and below the disease.

An appearance of blue distended veins, and a shining smoothness, are the only alterations to be noticed in the skin covering the enlarged joint. The shining smoothness seems attributable to the distention, which obliterates the natural furrows and wrinkles of the cutis. When the joint is thus swollen, the integuments cannot be pinched up into a fold, as they could in the state of health, and even in the beginning of the disease.

As the distemper of the articulation advances, collections of matter form around the part, and at length burst. The ulcerated openings sometimes heal up; but, such abscesses are generally followed by other collections, which pursue the same course. In some cases, these abscesses form a few months after the first affection of the joint; on other occasions, several years elapse, and no suppuration of this kind makes its appearance.

Such terrible local mischief must necessarily produce constitutional disturbance. The patient's health becomes gradually impaired, he loses his appetite and natural rest and sleep; his pulse is small and frequent; an obstinate debilitating diarrhœa, and profuse nocturnal sweats, ensue. These complaints are, sooner or later, followed by dissolution, unless the constitution be relieved in time, either by the amendment, or removal of the diseased part. In different patients, however, the course of the disease, and its effects upon the system, vary considerably in relation to the rapidity with which they occur.

Rheumatic white-swellings are very distinct diseases from the scrophulous distemper of the large joints. In the first, the pain is said never to occur without being attended with swelling. Scrophulous white-swellings, on the other hand, are always preceded by a pain, which is particularly confined to one point of the articulation. In rheumatic cases, the pain is more general, and diffused over the whole joint.

It seems probable, that all cases, in which the structure of the bones is found quite undiseased, and in which all the mass of disease seems to be confined to the soft parts, are not scrophulous white-swellings. Few persons, who have attained the age of five and twenty, without having had the least symptom of scrophula, ever experience, after this period of life, a first attack of the white-swelling of the strumous kind. All cases, in which the internal structure of the heads of the bones becomes softened, are probably scrophulous.

Mr. Russell has noticed the frequent enlargement of the lymphatic glands in the groin, in consequence of the irritation of the disease when in the knee; but, he justly adds, that this secondary affection never proves long troublesome.

When the bones are diseased, the head of the tibia always suffers more than the condyles of the thigh bone. (*Russell.*) The articular surface of the femur sometimes has not a single rough or carious point, notwithstanding that of the tibia may have suffered a great deal. The cartilaginous coverings of the heads of the bones are generally eroded first at their edges; and, in the knee, the cartilage of the tibia is always more affected than that covering the condyles of the thigh bone. Indeed, when white-swellings have their origin in the bones, and the knee is the seat of the disorder, there is some ground for supposing, that it is in the tibia, that the morbid mischief first commences.

The ligaments of the knee are occasionally so much weakened, or destroyed, by this terrible malady, that the tibia and fibula become, more or less, dislocated backward, and drawn towards the tuberosity of the ischium, by the powerful action of the flexor muscles of the leg.

I have seen a curious species of white-swelling, in which the leg could be bent to each side to a very considerable distance, both when the knee was extended and bent. Such a state implies a preternatural looseness of the ligaments of the articulation.

Scrophulous white-swellings, no doubt, are under the influence of a particular kind of constitution, termed a *scrophulous* or *strumous habit.* In this sort of temperament, every cause capable of exciting inflammation, or any morbid and irritable state of a large joint, may bring on such disorder as may end in the severe disease of which we are now speaking.

In a man of a sound constitution, an irritation of the kind alluded to, might only induce common healthy inflammation of the affected joint.

In scrophulous habits, it also seems probable, that irritation of a joint is much more easily produced than in other constitutions; and no one can doubt, that when once excited in the former class of subjects, it is much more dangerous, and difficult of removal, than in other patients.

The doctrine of particular white-swellings being scrophulous diseases, is supported by many weighty reasons, the opinions of the most accurate observers, and the evidence of daily experience. Wiseman (*Book* 4, *chap.* 4.) calls the *spina ventosa* a species of scrophula, and tells us, that infants and children are generally the subjects of this disease. The disorder is said by Severinus to be exceedingly frequent in young subjects. Petrus de Marchettis has observed both male and female subjects affected with what are called strumous diseases of the joints, as late as the age of five and twenty; but not afterwards, unless they had suffered from scrophula before that period of life, and had not been completely cured. R. Lowerus also maintains a similar opinion. Even though a few persons have scrophulous diseases of the joints, for the first time, after the age of twenty-five, this occurrence, like the first attack of scrophula after this period, must be considered as extremely uncommon.

Another argument, in favour of the doctrine, which sets down particular kinds of white-swellings as scrophulous, is founded on the hereditary nature of such forms of disease.

Numerous continental surgeons, particularly Petit and Brambilla, have noticed how very subject the English are both to scrophula and white-swellings of the joints. We every day see, that young persons afflicted with the present disease, are generally manifestly scrophulous, or have once been so. Very often enlarged lymphatic glands in the neck denote this fatal peculiarity of constitution; very often the patients are known to have descended from parents who had strumous disorders. (*Crowther.*)

Besides the general emblems of a scrophulous constitution, which we shall notice in the article *Scrophula,* we may often observe a shining, coagulated, flaky substance, like white of egg, blended with the contents of such abscesses as occur in the progress of the disease. This kind of matter is almost peculiar to scrophulous abscesses, and forms another argument in support of the foregoing observations relative to the share, which scrophula frequently has in the origin and course of many white-swellings.

### TREATMENT OF WHITE-SWELLINGS.

In practice we meet with all these cases both scrophulous and rheumatic, in two very opposite states; sometimes the diseased joint is at the same time affected with a degree of acute inflammation; in other instances, the malady is entirely chronic.

The imprudence of patients in walking about, and disturbing the diseased part, is very often the occasion of a degree of acute inflammation, which is denoted by the tenderness of the joint when handled by the surgeon, and also by the integuments feeling hotter than those of the healthy knee. Acute inflammation is itself a frequent forerunner of the most inveterate diseases of the joints.

When such state exists, there can be no doubt, that topical bleeding, fomentations, emollient poultices, or cold saturnine lotions, are means which may be eminently serviceable. The antiphlogistic regimen is now strongly indicated. Cooling purges of the saline kind should also be exhibited. Blood may be taken from the arm, and also from the diseased part, either by means of leeches or cupping. Mr. Latta gives the preference to the latter method, whenever it can be employed; and he very properly remarks, that little advantage can be expected from topical bleeding of any kind, unless the quantity of blood taken away be considerable. Ten or twelve ounces by cupping should be taken away at a time, and the operation should be repeated at proper intervals, till the tenderness and heat of the skin have entirely subsided. When leeches are used, the number ought to be considerable, and Mr. Latta recommends the application of at least sixteen or twenty. (*System of Surgery*, *Vol.* 1, *chap.* 6.)

Although these antiphlogistic means are judiciously put into practice, when acute inflammation prevails; yet such practitioners as lose weeks and months in the adoption of this treatment, are highly censurable. While the skin is hot and tender, while the joint is affected with very acute and general pain, and while the patient is indisposed with the usual symptoms of inflammatory fever, great benefit may be rationally expected from the above plan. When, however, this stage of the disorder is over, and the disease is truly chronic, different plans are indicated.

It is quite unnecessary to expatiate further on the mode of treating white-swellings complicated with acute inflammation. The most eligible plan of arresting the morbid process in the bones, ligaments, cartilages, and soft parts surrounding the articulation, and the most successful method of lessening the chronic enlargement of the joint, are the subjects at present demanding our earnest investigation.

The works of Hippocrates, Celsus, Rhazes, Hieron. Fabricius, &c. compared with modern surgical books, will soon convince us, that the practice of the ancients, in the treatment of diseased enlarged joints, does not much differ from the plan now pursued by the best modern surgeons. Mr. Crowther remarks, that the ancients used local and general blood-letting, the actual and potential cautery, with vesicating and stimulating applications to the skin. They further maintained, that sores, produced by these means, should have their discharge promoted, and continued for a considerable length of time.

In the cases, which appear from Mr. Brodie's account, to depend principally upon inflammation of the synovial membrane, the acute stage of the disease is to be treated according to the principles explained in the section on inflammation of the joints. When the affection has become chronic, perfect rest. and leeches, or cupping, followed by the application of a large blister, are the means which this gentleman recommends. " Under this treatment, the pain is relieved, and in a few days, the swelling, as far as it depends on the fluid collected in the cavity of the joint, is much diminished. Even where the tumour is solid, arising from the effusion of coagulable lymph, it will in a great measure subside, and sometimes be entirely dispersed, provided the lymph has not yet become organized. A single blister often produces marked good effects; but, it is generally necessary to repeat both the blister and the blood-letting several times. The repeated application of blisters is more efficacious, than a single blister kept open by the savine cerate." (See *Medico-Chir. Trans. Vol.* 5, *p.* 247.) When the inflammation has been much subdued, the same gentleman thinks moderate exercise of the joint rather beneficial, and commends the use of a stimulating liniment composed of ℥iss of olive oil, and ℥ss of sulphuric acid. This application, when too irritating, is to be weakened with an addition of oil, and is not to be used before inflammation is subdued, lest it aggravate the disease. Issues and setons, which are useful in ulceration of the cartilages, are of no use in this disease. Plasters of gum ammoniac, and others of a similar nature, are of little efficacy, while inflammation exists, but afterwards they are of use in guarding the joint from the influence of external cold, and preventing a relapse. For the removal of a moderate degree of swelling and stiffness, left by the past inflammation, Mr. Brodie praises exercise of the limb, and friction with camphorated mercurial ointment, or by the hand with starch. When the friction, however, produces inflammation again, it is to be discontinued, and leeches applied. When the swelling and stiffness are considerable, Mr. Brodie has never seen friction do much good, and, as it is in such cases, particularly apt to bring on inflammation again, it is to be employed with much caution. According to Mr. Brodie, friction is more efficacious, where the stiffness of a joint depends on a contracted state of the muscles, or tendons of the limb, and on these being glued to each other, and to the surrounding parts, than where it is the consequence of disease in the joint itself. In some cases, the pumping of warm water on the part from a height of several feet, as practised at some of the watering places, is beneficial; but, in this plan, the same cautions are necessary, as in the employment of friction. (*Op. cit. p.* 249—250.)

With regard to the cases, which Mr. Brodie describes as depending upon a total loss of the natural structure of the synovial membrane, which is converted into a pulpy substance one quarter or one half of an inch in thickness, they are according to this gentleman incurable, and they at length end in ulceration of the cartilages, abscesses, &c. Hence, when the health begins to suffer, he considers amputation to be indicated. (*P.* 254.)

When white-swellings are accompanied with ulceration of the cartilages, all motion of the joint is extremely hurtful. Indeed, as Mr. Brodie well observes, keeping the limb in a state of perfect quietude, is a very important, if not the most important circumstance, to be attended to in the treatment. According to this gentleman, it is in these cases, in which ulceration of the cartilages occurs as a primary disease, that caustic issues are usually productive of singular benefit; but, he deems them of little use in any other diseases of the joints. He thinks setons and blisters, kept open with savine cerate, may also be used with advantage in the same description of cases. Bleeding can only be proper, when from improper exercise, the articular surfaces are inflamed, and there is pain and fever. Mr. Brodie asserts, that the warm bath relieves the symptoms in the early stage, if it does not stop the progress of the disease; but, he condemns plasters of gum ammoniac, embrocations, liniments, and frictions, as either useless or hurtful. (See *Medico-Chir. Trans. Vol.* 6, *p.* 332—334.)

Topical applications, consisting of strong astringents of the mineral and vegetable kingdom, suffice for the cure of some mild descriptions of white-swellings. A decoction of oak bark, containing alum, is what is recommended for this purpose by Mr. Russell.

My own experience will not allow me to say much in favour of electricity, as an application for the relief of white-swellings. Upon the whole, I must rank electricity among inactive measures; for, though, in a few cases, it has appeared to do good; in others it has done harm, by making the disease more irritable and rapid in its progress; while in most instances, its effects have been so insignificant, as to make it difficult to decide, whether they were of a favourable or an unfavourable nature.

"If the tumour is quite indolent, (says Richerand) the application of galvanism may be proposed; it is not, however, exempt from danger, and on one occasion, where I employed it, lancinating pains and swelling of the joint were brought on by it." (*Nosographie Chirurgicale, tom.* 3, *p.* 174, *Edit.* 2.)

Cases occur, in which a lotion composed of sea-water is productive of benefit. I mean to say, that this application frequently diminishes the enlargement of the joint; but it hardly ever accomplishes a perfect cure.

The conjoined operation of sea-air and sea-bathing has undoubtedly a most powerful influence over scrophulous diseases of the joints, as well as most other strumous disorders; but the application of sea-water alone, in the form of a lotion, cannot be greatly praised, because it prevents the surgeon from having recourse to a better plan of treatment. Even the trial of sea-air and bathing unitedly can only be recommended as an auxiliary plan, to be adopted in conjunction with other more certainly efficacious measures.

Poultices, made of sea-weeds, deserve the same kind of praise as has been given to the sea-water lotion.

Every one is well acquainted with the efficacy of friction in exciting the action of the absorbents. To this principle we are to impute the great benefit, which arises from what is termed, *dry rubbing*, in cases of white-swellings. This kind of friction is performed by the mere hands of an attendant, without using at the same time any kind of liniment, or other application whatsoever, excepting sometimes a little flour, or powdered starch, and the rubbing is continued several hours every day. At Oxford, many poor persons earn their livelihood by devoting themselves to this species of labour, for which they are paid a stipulated sum per hour. The opinions of Mr. Brodie on the cases, in which friction is proper, or improper, have been already explained.

I look upon all mere emollient applications, such as fomentations and poultices, as quite destitute of real efficacy, except when active inflammation is present, and, though they serve to amuse the patient, they ought not to be recommended. That surgeon, who merely strives to please his patient's fancy, without doing any real good to him, in regard to his affliction, may be considered as doing harm, because the semblance of something being done too often hinders other really useful steps from being pursued. The French surgeons are particularly liberal in the praises which they bestow on such warm emollient remedies, as poultices, steam of hot water, fomentations, &c. and they adduce instances of white-swellings being cured in this manner. But, whoever has had opportunities of observing the inveterate nature of the disease in this country, will hardly be inclined to recommend the practice, unless the case be complicated with a degree of acute inflammation.

The only method of treatment, which my own personal experience enables me strongly to recommend, for scrophulous white-swellings, consists in keeping up a discharge from the surface of the diseased joints. The opportunities which I have had of observing the effects of blisters, and caustic issues, rather incline me, however, to prefer the former to the latter. I have seen great good derived from both; but more from blisters, than the other kind of issue. There are instances in which I should employ vesicating applications; there are others in which I should prefer making an eschar with caustic. I have seen many instances in which the application of a blister could never be endured, in consequence of the general inflammatory affection, which it occasioned throughout the diseased joint.

The blister should always be large.

Many surgeons, instead of following Mr. Crowther's plan, prefer blistering first one side of the joint, and then the other alternately, for a considerable length of time. "Blisters, (says Mr. Latta) may be put upon each side of the patella, and ought to be of such a size and shape, as to cover the whole of the swelling, on the inside, from the hinder part of the joint, at the edge of the hollow of the thigh, to the edge of the patella, over the whole extent of the swelling above and below. As soon as the blister is taken off from one side, it ought to be applied to the other, and thus repeated alternately, until both swelling and pain be completely removed. When this is the case, the patient ought to be directed to rub the joint well with a liniment, composed of half an ounce of camphor, dissolved in two ounces of oil, with the addition of half an ounce of spir. sal-ammon. caust. or, as it is now called, aqua ammoniæ. This is to be used three times a day; and in this way, (continues Mr. Latta) I have successfully treated many cases of white-swellings." (*Syst. of Surgery, Vol.* 1, *chap.* 6.)

In the beginning, caustic issues are even more painful, than blisters; but they afterwards become more like indolent sores, and are more easily kept open, for a length of time, than blisters. Such issues are commonly made on each side of the diseased joint, and of about the size of a half-crown. The manner of making the eschars, and keeping these issues open, is explained, in the article *Issue.*

The question has been contested, among surgical writers and practitioners, whether blisters and issues produce benefit, upon the principle of counter-irritation, or in consequence of the discharge, which they occasion. They probably operate efficaciously in both ways; for there is no doubt, that mere rubefacients possess the power of rousing the action of the absorbents, and they may also modify the vascular action of diseased parts. These applications can obviously only act upon the principle of counter-irritation, and, they have not been here recommended particularly for white-swellings, because, it seems to me, that whenever some good might be derived from their employment, much more benefit could always be obtained from blisters and issues. This sentiment is confirmed by experience, and we must, therefore, impute a great degree of efficacy to the maintenance of a purulent discharge from the vicinity of the diseased part.

We have noticed the efficacy of friction, in exciting the action of the absorbents, by which the thickened state of parts around the affected joint, may be considerably lessened, and, on this principle, the utility of dry-rubbing arises. We have now to notice the method of producing the same effect by pressure, a plan, which yet seems to merit a more extensive trial. I have seen in St. Bartholomew's Hospital, a few cases, in which the swelling of the joints was materially diminished, by encircling the morbid articulations with strips of adhesive plaster, applied with moderate tightness.

A somewhat similar plan, though its modus operandi is differently accounted for, appears also to have been tried in France. "J'ai dans quelques occasions (says Richerand) obtenu les plus grands avantages de l'application d'un taffetas ciré autour de l'articulation tuméfiée. On coupe un morceau de cette étoffe, assez large pour envelopper la totalité de la tumeur; on enduit les bords d'une gomme dissoute dans le vinaigre, et susceptible de la faire adhérer intimement à la peau; on l'applique ensuite de manière que tout l'accès soit interdit à l'air entre lui et les téguments. Lorsqu'au bout de quelques jours on lève cet appareil, on trouve la peau humide, ramollie par l'humeur de la transpiration condensée en goutelettes à la surface intérieure du, taffetas. Dans ce procédé, on établit un espèce de bain de vapeur autour de l'articulation malade. (*Nosographie Chirurgicale, Tom.* 3, *p.* 175, *Edit.* 2.)

My friend, the late Mr. Clement Wilson Cruttwell, of Bath, sent me a very excellent case, illustrative of the efficacy of treatment by pressure. He remarks, that, "After cupping the part, and endeavouring to quiet the inflammation, I used blisters; but they excited such intolerable pain, and produced so great a degree of swelling and inflammation, that I was under the necessity of healing them immediately. After two months strict confinement to bed, and the use of leeches and refrigerant washes, the inflammation having again subsided, and the pain being removed, I again ventured to apply one small blister, and again a similar attack of pain, swelling, and inflammation, was produced. The joint became distended with fluid, of which it had always contained a large quantity, and the irritation of the constitution was excessive. By the liberal use of opium, I once more succeeded in quieting the disturbance, and, convinced of the hazard of using blisters in such a subject, I applied moderate pressure, by means of a roller, together with a wash, containing a large proportion of spirit, in order to keep up a constant evaporation. The skin, which was before much inflamed, and hard, has become natural and flaccid, the pain has ceased, the swelling has diminished, and I have every prospect of effecting a cure, with the preservation of tolerably free motion in the joint."

Mr. Cruttwell, in a subsequent letter informed me, that this case got completely well, by the treatment with pressure, and has remained so for upwards of six months, under full and free exercise.

This example clearly evinces the impropriety of using blisters in certain constitutions. In some remarks, annexed to the above case, Mr. Cruttwell expresses his conviction, that absolute rest, cold applications, and pressure, would succeed in very many cases, without local counter-irritation. Pressure, he adds, succeeds best, when fluid is effused, and the disease is indolent; but, he is convinced that it may be used with advantage in later stages, when abscesses have formed, and sinuses already exist. Mr. Cruttwell, with his usual accuracy of observation, next reminds me, how very serviceable continued pressure is to the scrophulous finger-joints of children.

From what has been stated, I am firmly of opinion, that all impartial practitioners will be disposed to give pressure a more extensive trial, as a means of relieving a disease which too frequently foils every effort of the most skilful surgeon.

We have noticed, that when the knee is affected, there is a great tendency in the limb to become permanently bent. It might undoubtedly be very judicious to oppose the occurrence of this position, by means of splints, which would also serve to prevent all motion of the diseased joint, an object of the very highest importance. Were the disease to end in anchylosis, the advantage of having the limb in a state of extension need scarcely be mentioned.

Numerous diseased joints are undoubtedly connected with a kind of constitution, called scrophulous. Hence, it seems rational to combine, with the local treatment, the employment of such internal remedies, as have been known to do good in other scrophulous diseases. Hectic symptoms are those, which we commonly have to palliate in these cases. When the appetite is impaired, and the stomach will bear bark, this medicine should be given with the aromatic confection. Above all internal remedies, opium claims the highest recommendation, as it at once tends to keep off and relieve a debilitating diarrhœa, which too frequently prevails, at the same time that it alleviates pain, and procures sleep. The objection, made against its exhibition, on the ground that it increases perspiration, seems exceedingly frivolous, when the above important benefits are taken into consideration.

Too often, however, the terrible disease of which we are now treating baffles all human skill and judgment, and the unhappy patient's health having declined to the lowest state, he is necessitated to submit to amputation, as the only chance of preserving life. It has been explained in the article *Amputation*, that the condition of the patient's health, and not of the diseased joint, can form the only solid reason for recurring to the severe operation of removing the limb. If the patient's constitution be equal to a longer struggle, no man can pronounce, that every prospect of saving the limb is at an end. Many diseased joints, apparently in the most hopeless condition, frequently take a favourable turn, and, after all, allow the limb to be saved. The state of the health is the chief consideration, in forming a judgment respecting the propriety of amputation.

The proposal of cutting out diseased joints has been considered in the article *Amputation*.

### DISEASE OF THE HIP-JOINT.

This complaint is very analogous in its nature to the white swelling of other articulations. In the same way, as the latter disorder, it seems probable that the disease of the hip has its varieties, some of which may be connected with scrophula, while others cannot be suspected to have any concern with a strumous habit. The present complaint is most frequently seen attacking children under the age of fourteen; but, no age, no sex, no rank, nor condition of life is exempt from the possibility of being afflicted, so that though children form a large proportion of those subjects, who are attacked; yet the number of adults, and even of old persons, is considerable.

The approach of the disease of the hip-joint is much more insidious, than that of a white-swelling. Severe pains generally precede the latter affection; but, the only forerunner of the former is frequently a slight weakness, and limping of the affected limb. These trivial symptoms are very often not sufficiently urgent to excite much notice, and, when observed by superficial practitioners, are commonly neither understood, nor treated according to the dictates of surgical science. As there is, also, very often an uneasiness in the knee, when the hip is affected, careless practitioners frequently mistake the seat of disease, and I have many times seen patients, on their entrance into an hospital, having a poultice on their knee, while the wrong state of the hip was not at all suspected.

This mistake is extremely detrimental to the patient, not on account of any bad effect, resulting from the applications so employed; but, because it is only in the incipient period of the complaint, that a favourable prognosis can be made. In this stage of the disease, mere rest and repeated topical bleeding, will do more good in the course of a fortnight, than large painful issues will afterwards generally accomplish in the long space of a twelvemonth.

The symptoms of the disease of the hip-joint, when only looked for in the situation of that articulation, are not very obvious to the surgical examiner. Though the attention of the surgeon is, in some instances, soon called to the right situation of the disease, by the existence of a fixed pain behind the trochanter major; yet, it is too often the case, that mere pain about an articulation, entirely destitute of visible enlargement and external alteration of colour, is quite disregarded, as a complaint of no importance in young subjects, and as a mere rheumatic, or gouty affection, in adults. Patients frequently complain of most of their painful sensations being in the groin, and all accurate observers have remarked, that, in the hip-disease, the pain is not confined to the real seat of disease, but shoots down the limb, in the course of the vastus externus muscle to the knee.

The early symptoms of disease in the hip-joint are only strongly delineated to such practitioners, as have acquired the necessary information relative to this part of surgery, from careful study, and extensive experience.

We shall next trace those characters of the present disease, which serve to denote its existence.

It is a curious circumstance, that when the functions of a limb are obstructed by disease, the bulk of the member generally diminishes, and the muscles become emaciated. Nearly as soon as the least degree of lameness can be perceived, the leg and thigh have actually wasted, and their circumference has diminished.

If the surgeon make pressure on the front of the joint, a little on the outside of the femoral artery, after it has descended below the os pubis, great pain will be experienced.

The limping of the patient is a clear proof that something about the limb is wrong, and, if such limping cannot be imputed to diseased vertebræ, or some recent accident, and if, at the same time, the above-mentioned emaciation of the limb exists, there is great cause to suspect, that the hip is diseased, particularly, when the pain is augmented by pressing the front of the acetabulum.

Diseased vertebræ, perhaps, always produce a paralytic affection of both legs at once, and they do not cause painful sensations about the knee, as the hip-disease does.

The increased length of the limb, a symptom that has been noticed by all practitioners since De Haen, is a very remarkable and curious occurrence, in the early stage of the present disease. This symptom is easily detected by a comparison of the condyles of the os femoris, the trochanter major, and malleoli, of the diseased limb, with those parts of the opposite member, taking care that the patient's pelvis is evenly situated. The thing is the more striking, as the increased length of the member is frequently as much as four inches. The rationale of this fact, John Hunter used to explain by the diseased side of the pelvis becoming lower, than the other. (*Crowther, p.* 266.)

The same thing was also noticed by Falconer, (*On Ischias, p.* 9,) long before the period, when Mr. Crowther printed his second edition.

An appearance of elongation of the limb is not exclusively confined to the early stage of the morbus coxarius: it may attend other cases. I remember seeing in one of the wards of St. Bartholomew's Hospital, a little girl, with a diseased knee, whose pelvis was considerably distorted in this manner, so that the limb of the same side appeared much elongated. Her hip-joint was quite sound. This case was pointed out to Mr. Lawrence and myself by Mr. Cother, of Gloucester.

Mr. Ford has very accurately called the attention of surgeons to the alteration, with respect to the natural fulness and convexity of the nates, that part appearing flattened, which is usually most prominent. The gluteus magnus becomes emaciated, and its edge no longer forms so bold a line, as it naturally does at the upper and back part of the thigh, in the sound state of the limb.

Although this symptom, in combination with others, is of importance to be attended to, it has been explained by Mr. Brodie, that "it is not in itself to be regarded, as a certain diagnostic mark of disease in the hip; since, in its early stage, this symptom is wanting; and it is met with in other diseases, in which the muscles in the neighbourhood of the hip are not called into action, although the joint itself is unaffected." (See *Medico-Chir. Trans. Vol.* 6, *p.* 322.)

Though there may be more pain about the knee, than the hip, at some periods of the malady in its incipient state, yet, the former articulation may be bent and extended, without any increase of uneasiness; but, the os femoris cannot be moved about, without putting the patient to immense torture.

The patient soon gets into the habit of bearing the weight of his body chiefly upon the opposite limb, while the thigh of the affected side is bent a little forward, that the ground may only be partially touched with the foot. This position is found to be the most comfortable, and every attempt to extend the limb occasions an increase of pain.

This is the first stage of the disease, or the one, which is unaccompanied with suppuration.

The symptoms which precede the formation of pus, vary in different cases, according as there is acute, or chronic inflammation present. When the diseased joint is affected with acute inflammation, the surrounding parts become tense and extremely painful; the skin is even reddish; and symptoms of inflammatory fever prevail. When the severity of the pain abates, a swelling occurs in the vicinity of the joint, and a pointing quickly follows.

When the abscess is a chronic one, there is no particular increase of pain preceding the collection of matter.

Startings and catchings during sleep are said to be among the most certain signs of the formation of matter, in this stage of the disease.

We have noticed the lengthened state of the limb, in the first periods of the hip-disease. This condition is not of very long duration, and is sooner, or later succeeded by a shortening of the affected member. The toes are turned inwards; the great trochanter is approximated to the crista of the os ilium; the leg is in a state of flexion; and all the symptoms of a luxation of the thigh upwards and outwards, may be observed, the head of the bone, indeed, being actually drawn into the external iliac fossa, and carried betwixt the os innominatum and gluteus minimus, which is raised up by it. (See *Richerand's Nosographie Chirurgicale, Tom.* 3, *p.* 171, 172, *Edit.* 2.)

When the retraction is very considerable, it arises from nothing less, than an actual dislocation of the head of the thigh-bone, in consequence of the destruction of the cartilages, ligaments, and articular cavity. This retraction sometimes comes on long before any suppuration takes place. The head of the bone is sometimes dislocated, and the disease terminates in anchylosis, without any abscess whatever. However, if suppuration has not taken place, Mr. Brodie believes, it rarely happens, that the limb, after the cure, does not regain its natural degree of mobility. (See *Medico-Chir. Trans. Vol.* 6, *p.* 325.)

It is worthy of particular notice, that the head of the bone is always luxated upwards and outwards; and the only exception to this observation, upon record, is a case related by the celebrated Italian practitioner Cocchi, in which a spontaneous dislocation of the thigh-bone, as it is termed, happened upwards, forwards, and a little inwards. (See *Levéillés, Nouvelle Doctrine Chirurgicale, Tom.* 3, *p.* 595.) On a également vu la tête du fémur luxée en dedans et en bas, et placée sur le trou obturateur, mais ce mode de déplacement consécutif, dans lequel le membre est alongé, est infiniment rare. (*Richerand, Nosographie Chirurgicale, Tom.* 3, *p.* 172.)

The hip-disease generally induces hectic symptoms, after it has existed a certain time. In some subjects, such symptoms soon come on; in others, the health remains unaffected a very considerable time.

"The health of the patient (says Mr. Brodie) usually suffers, even before abscesses have formed, from the want of exercise, pain, and particularly from the continued disturbance of his natural rest. I recollect no instance of an adult, in whom abscesses had formed, and who did not ultimately sink exhausted by the hectic symptoms, which these induced. Children may recover in this ultimate stage of the disease; but, seldom without a complete anchylosis of the joint." (*Medico-Chir. Trans. Vol.* 6, *loco cit.*)

When abscesses of the above description burst, they continue, in general, to emit an unhealthy thin kind of matter for a long time afterwards.

With respect to the morbid anatomy of the disease in its incipient state, until lately little was known. Two dissections related by Mr. Ford were, perhaps, the only ones throwing light upon this point. In one, there was a tea-spoonful of matter in the cavity of the hip-joint. The head of the thigh-bone was a little inflamed, the capsular ligament a little thickened, and the ligamentum teres united in its natural way to the acetabulum. The cartilage lining the cotyloid cavity was eroded in one place, with a small aperture, through which a probe might be passed, underneath the cartilage, into the internal surface of the os pubis on one side, and, on the other, into the os ischii; the opposite, or external part of the os innominatum shewing more appearance of disease, than the cotyloid cavity. In the other instance, the disease was more advanced. These examples are important, inasmuch as they prove that what is commonly called the disease of the hip-joint, primarily affects the cartilages, ligaments, and bones, and not the surrounding soft parts as De Haen, and some others, would lead one to believe.

As the disorder advances, the portions of the os ischium, os ilium, and os pubis, composing the acetabulum, together with the investing cartilage, and synovial gland, are destroyed. The cartilage covering the head of the os femoris, the ligamentum teres, and capsule of the joint, suffer the same fate, and caries frequently affects not only the adjacent parts of the ossa innominata, but also the head and neck of the thigh-bone. The bones of the pelvis, however, are always more diseased than the thigh-bone, a fact, which displays the absurdity of ever thinking of amputation in these cases. Mr. Ford observes, "In every case of disease of the hip-joint, which has terminated fatally, I have remarked, that the os innominatum has been affected by the caries in a more extensive degree, than the thigh-bone itself." (*Observations on the Disease of the Hip-joint, p.* 107.)

Sometimes, however, the head and neck of the thigh-bone are annihilated, as well as the acetabulum.

Mr. Brodie has had opportunities of dissecting some diseased hip-joints both in the incipient and advanced stage of the malady. From his observations, it appears; 1st. That the disease commences with ulceration of the cartilages, generally that of the acetabulum first, and that of the femur afterwards. 2. That the ulceration extends to the bones, which become carious; the head of the femur diminishing in size, and the acetabulum becoming deeper and wider. 3. That an abscess forms in the joint, which after some time makes its way by ulceration, through the synovial membrane and capsular ligament, into the thigh and nates, or even through the bottom of the acetabulum into the pelvis. Mr. A. Cooper shewed Mr Brodie two specimens, in which the abscess had burst into the rectum. 4. In consequence of the abscess, the synovial membrane and capsular ligament become inflamed and thickened. The muscles are altered in structure; sinuses are formed in various parts, and, at last, all the soft parts are blended together into one confused mass, resembling the parietes of an ordinary abscess. (*Brodie, in Medico-Chir. Trans. Vol.* 4 *p.* 246—247.)

Such are the beginning and progress of the ordinary disease of the hip-joint; but, it is admitted by Mr. Brodie, that there are other scrophulous cases, in which the mischief begins in the cancellous structure of the bones, and also other instances, which consist in chronic inflammation and abscesses of the soft parts in the neighbourhood of the hip. (*Op. cit. Vol.* 6, *p.* 326.)

External violence; laying down on the damp ground in summer time; and all kinds of exposure to damp and cold; are the causes to which the disease may sometimes be referred. Scrophula, no doubt, has, frequently, some concern in the origin of the malady; but, oftentimes, no rational cause of the complaint can be assigned.

## TREATMENT OF THE DISEASE OF THE HIP-JOINT.

The writings of Hippocrates, Celsus, Cælius Aurelianus, &c. prove, that the ancients treated the present disease much in the same way, as it is treated by the moderns. Forming an eschar, and keeping the sore open; topical bleeding; cupping; fomenting the part, &c. were all proceedings adopted in the earliest periods of surgery. Drs. Charlton, Oliver, and Falconer, have extolled Bath water, as a most efficacious application to diseased hip-joints, previous to the suppurative stage. However, had not their accounts been exaggerated, all patients of this kind would long ago have flocked to Bath, and the surgeons in other places would never have had further occasion to adopt a more painful mode of treatment.

The plan pursued at Bath, is to put the patient in a warm bath, two or three times a week, for fifteen or twenty-five minutes.

In the early period of the disease, entire rest, the application of fomentations, and the employment of topical bleeding, particularly cupping, are highly proper. Such practice, also, is invariably judicious, whenever the case is attended with symptoms of acute inflammation. When the fomentations are not applied, the lotio aquæ lithargyri acetati may be used.

This method of treatment ought never to be employed, unless there are manifest signs of active inflammation present. When no such state exists, this plan can only be regarded as preventing the adoption of a more efficacious one, and, therefore, censurable.

" Where the cartilages of the hip are ulcerated (says Mr. Brodie), the patient should, in the first instance, be confined to a couch, if not to his bed; and if the disease is far advanced, the limb should be supported by pillows properly disposed, so as to favour the production of an anchylosis, by allowing it to vary as little as possible from one position." (See *Medico-Chir. Trans. Vol.* 6, *p.* 335.) *Quibus diuturno dolore*, says Hippocrates, *ischiadico vexatis coxa excidit, iis femur contabescit et claudicant, nisi urantur.* Forming an eschar, or issue, is the most efficacious plan of treating the disease even now known.

A caustic issue seems to me more beneficial than a blister, in cases of diseased hips. The depression, just behind and below the trochanter major, is the situation, in which surgeons usually make the issue, and the size of the eschar should be nearly as large as a crown piece. It is, in general, necessary to keep the issue open a very long time. When the thigh-bone is dislocated, and the patient survives, the case mostly ends in anchylosis.

For the cure of the disease in adults, Mr. Brodie has also expressed a preference to caustic issues; but in children, and even in grown up persons when the complaint is recent, he thinks, that blisters are also capable of affording complete relief. He states, that, in these cases, they are more efficacious, when kept open with the savine ointment, than when repeatedly applied.

With respect to issues, he acknowledges, that behind the great trochanter is the most convenient place for them; but, he believes that they have more effect, when made on the outside of the joint, on the front edge of the tensor vaginæ femoris muscle. Instead of keeping the issue open with beans, Mr. Brodie has found it a more effectual practice to rub the sore, two or three times a week, with the potassa fusa, or sulphate of copper. In particular cases, where the pain was very severe, this gentleman made a seton in the groin over the trunk of the anterior crural nerve, which plan, he says, affords quicker relief, though in the end it is less to be depended upon for a cure, than caustic issues.

The occurrence of suppuration makes a vast difference in the prognosis. "The formation of even the smallest quantity of pus in the joint in cases of this disease, in the young person, considerably diminishes, and in the adult almost precludes the hope of ultimate recovery." (*Brodie, in Medico-Chir. Trans. Vol.* 6, *p.* 347.) This gentleman is not much in favour of opening the abscesses early, at least, before the joint has been kept for some time perfectly at rest. He has seen no ill consequences arise from the puncture of the lancet remaining open, and he has not found, that, in cases of carious joints, the method of evacuating the matter, recommended by Mr. Abernethy (see *Lumbar Abscess*), is attended with any particular advantage.

### FUNGUS HÆMATODES OF THE HIP-JOINT.

Mr. Burns, in the second volume of his "Dissertations on Inflammation," p. 311, has recorded a remarkable instance, in which this joint was affected with that intractable and fatal distemper, the fungus hæmatodes. The case was at first supposed to be the disease, of which we have just been treating in the preceding section. The limb seemed to be elongated, and issues were employed, without any material benefit. The upper part of the thigh swelled, while the lower wasted away. The patient lost his appetite, had a quick pulse, and passed sleepless nights. The part was rubbed with anodyne balsam, and laudanum given every night; but, these means were only productive of temporary benefit. After some months ,a difficulty of making water came on, which ended in a complete retention. It being found impracticable to introduce a catheter, and a large elastic tumour, supposed to be the distended bladder, being felt within the rectum, a trocar was pushed into the swelling. A good deal of bloody fluid was thus discharged. Afterwards a considerable quantity of high-coloured fetid urine continued to escape from the urethra. In about a week after this operation, the patient died.

On dissection, Mr. Burns found the hip-joint completely surrounded with a soft matter, resembling brain, inclosed in thin cells, and here and there other cavities, full of thin bloody water, presented themselves. The acetabulum and head of the os femoris were both carious. The muscles were quite pale, and almost like boiled liver, having lost their fibrous appearance. The same kind of substance was found in the pelvis, and most of the inside of the affected bones carious. Large cells, containing bloody water, were observed in the diseased substance, and it was into one of these cavities, that the trocar had entered, when the attempt was made to tap the bladder. See "*Treatise on the Diseases of the Joints,*" *being the observations for which the prize for* 1806 *was adjudged by the Royal College of Surgeons, London. Ford's Observations on the Disease of the Hip-Joint* are particularly excellent. See also *Crowther on White-Swelling, &c. Edit.* 2, 1808. *Latta's System of Surgery. Falconer on Ischias. Burns on Inflammation, Vol.* 2, *p.* 311. *Russell on Morbid Affections of the Knee. Hey's Practical Observations in Surgery, p.* 354, *&c. Edit.* 2. *Boyer's Traité des Maladies Chirurgicales, T.* 4. *Paris,* 1814. *Reimaries, De Tumore Ligamentorum circa articulos, Fungo articulorum dicto. Brambilla, in Acta Acad. Med-Chir. Vindob. T.* 1. *Brodie's Pathological Researches, respecting the Diseases of Joints, in Vol.* 4, 5 *and* 6 *of the Medico-Chirurgical Transactions. Richerand's Nosographie Chirurg. Tom.* 3, *p.* 170, *&c. Edit.* 4. *Delpech, Précis Elément. des Mal. Chir. T.* 2, *p.* 377, *T.* 3, *p.* 194, *p.* 470, *p.* 711, *&c. Paris,* 1816.

**JUGULAR VEIN,** how to bleed in. See *Bleeding.*

# K.

**KALI ÆRATUM.**—℞. Kali præparati ℥ss. Aq. distillatæ ʒv. Ammon. præparatæ ʒj. Dissolve the kali in a water-bath; add the ammonia; and, when the effervescence has ceased, let the fluid crystallize. Two drams are given as a lithontriptic, in a pint of distilled water, twice a day, at St. Bartholomew's Hospital. (*Pharmacopœia Chirurg.*)

**KALI ARSENICATUM.**—℞. Arsenici albi, Nitri purif., sing. ℥j. Crucibulo amplo igne candenti injice nitrum, et liquefacto adde gradatim arsenicum in frustulis donec vapores nitrosi oriri cessaverint. Solve materiam in aquæ distillatæ libris quatuor, et post idoneam evaporationem sepone ut fiant crystalli.

These crystals may be given in the

dose of one-tenth of a grain, thrice a day (*Pharm. Sancti Barthol.* 1799.) Justamond strongly recommended the internal exhibition of arsenic in cases of cancer. See *Cancer.*

**KALI PURUM.**—Potassa Fusa. This is one of the most useful caustics for destroying funguses, making issues, in cases of diseased vertebræ, white swellings, &c.; and it is recommended to be used in a particular manner, by Mr. Whately, for the cure of strictures in the urethra. When surgeons prefer opening buboes, or any other abscesses, with caustic, the kali purum is very commonly employed. When surgeons used to cure hydroceles, by destroying a part of the scrotum and tunica vaginalis with caustic, the kali purum, either alone, or mixed with quicklime, was made use of. (See particularly *Vertebræ, Diseased*; *Urethra, Strictures of, &c.*)

**KALI SULPHURATUM.** Two drams of this, dissolved in a pint of lime or distilled water, make an excellent lotion for the cure of tinea capitis. Many other cutaneous affections yield, also, to the same remedy. When arsenic has been swallowed as a poison, it is best to give first, twenty grains of zincum vitriolatum, as an emetic the quickest in its operation; and, after keeping up the vomiting by drinking warm water, and, what is better, sweet oil, it is recommended to make the patient drink as much as possible of a solution of the kali sulphuratum, the sulphur of which is known to blunt the activity of the mineral.

**KNEE, DISEASES OF.** See *Joints.*

# L.

**LAGOPHTHALMIA, or LAGOPHTHALMOS.** (from λαγος, a hare; and οφθαλμος, an eye.) *The Hare's Eye.* A disease, in which the eye cannot be shut. The following complaints may arise from it; a constant weeping of the organ, in consequence of the interruption of the alternate closure and opening of the eyelids, which motions so materially contribute to propelling the tears into the nose; blindness in a strong light, in consequence of the inability to moderate the rays, which enter the eye; on the same account, the sight becomes gradually very much weakened; incapacity to sleep where there is any light; irritation, pain, and redness of the eye, from this organ being exposed to the extraneous substances in the atmosphere, without the eye-lids having the power of washing them away, in the natural manner.

An enlargement, or protrusion of the whole eye, or a staphyloma, may obviously produce lagophthalmos. But, affections of the upper eye-lids are the common causes. Heister says, he has seen the complaint originate from a disease of the lower one. Now and then lagophthalmos depends on paralysis of the orbicularis muscle. A cicatrix, after a wound, ulcer, or burn, is the most frequent cause.

When lagophthalmos arises from a paralytic affection of the orbicularis palpebrarum, the eye-lids may be rubbed with the tinctura cantharidum, and cold water, or the linimentum camphoræ. Electricity is also considered as a principal means of cure, (*Chandler*) together with the exhibition of bark, the use of the shower-bath, &c.

When the affection arises from spasm of the levator palpebræ superioris, electricity, a small blister on the neighbouring temple, and rubbing the eye-lid and eye-brow with the tinctura opii, are good means. Internal antispasmodic medicines may also be tried.

When lagophthalmos arises from the contraction of a cicatrix, its relief is to be attempted precisely on the same principles as the ectropium. (See *Ectropium.*) In some cases, it will not be amiss, especially at night, to lay plasters, drawing in contrary directions upon each lid, and to assist them with a compress and bandage. (*Chandler.*)

The inconveniences, depending on the eye being unable to shelter itself from the light, are to be obviated by wearing a green shade, till the disorder is cured.

Whoever is acquainted with German, and is desirous of more minute information on this subject, may find an excellent account of lagophthalmos in *Richter's Anfangsgr. der Wundarzn. Band* 2. *Von dem Hassenauge.* See also *Chandler on the Diseases of the Eye. Chap.* 2.

**LARYNGOTOMY.** (from λαρυγξ, the larynx; and τεμνω, to cut.) The cutting an opening into the larynx. (See *Bronchotomy.*)

**LATERAL OPERATION.** One mode of cutting for the stone is so termed. (See *Lithotomy.*)

**LENTICULAR.** (from *lenticulaire,* doubly convex.) An instrument, contained in every trephining case, and employed for removing the rough particles of bone from the edge of the perforation, made in the cranium with the trephine. One side of its blade is convex, the other concave; and one of its edges is sharp. On the end of the blade is fixed a little shallow cup, with its concavity towards the handle of the instrument. This part serves the purposes of receiving the little pieces of bone, when detached, keeping the end of the blade from hurting the dura mater, and, when applied under the margin of the opening, enables the operator to guide the edge of the instrument all round it, with steadiness and security.

**LEUCOMA.** (from λευκος, white.) Leucoma and albugo are often used synonymously, to denote a white opacity of the cornea. Both of them, as Scarpa remarks, are essentially different from the nebula of the cornea; for, they are not the consequence of chronic ophthalmy, attended with varicose veins, and an effusion of a milky serum into the texture of the delicate continuation of the conjunctiva over the cornea; but, are the result of violent acute ophthalmy. In this state, a dense coagulating lymph is extravasated from the arteries; sometimes superficially, at other times deeply into the substance of the cornea. On other occasions, the disease consists of a firm callous cicatrix on this membrane, the effect of an ulcer, or wound, with loss of substance. The term *albugo,* strictly belongs to the first form of the disease; *leucoma* to the last, more particularly when the opacity occupies the whole, or the chief part, of the cornea.

The recent albugo, remaining after the cure of a severe acute ophthalmy, is of a clear milky colour; but, when of ancient date, it becomes pearl-coloured. Some cases, which have existed a considerable time, do not seem to have any connection with the vascularity of the cornea; for they continue insulated in the middle of the transparent portion of this membrane, without occasioning the least uneasiness to the patient, the least disturbance of the rest of the eye, or any attempt of the absorbents to remove them.

The recent albugo, provided the organization of the cornea be not destroyed, may generally be dispersed by the means employed for the relief of the first and second stages of acute ophthalmy; viz. general and topical blood-letting with internal antiphlogistic medicines, and topical emollients for the first; slightly irritating and corroborant applications for the second. As soon as the inflammation has subsided, the latter should be employed; for, by making the absorbents remove the coagulating lymph, deposited in the cornea, they restore the transparency of this membrane.

But, though this may often be accomplished in the recent state of albugo, it is not so easy to be done, when the long duration of the disease has paralized the absorbents of the affected part of the cornea; or when the deposition of a dense tenacious substance into its intimate texture, has subverted its organization. In one instance, the matter forming the albugo cannot be absorbed; in the other, it leaves the cornea so much injured, after its absorption, that this membrane still continues opaque. (*Scarpa.*)

The recent condition of the disease, without disorganization of the structure of the cornea; its occurrence in young subjects, whose absorbents are readily roused by external stimulants; are circumstances very favourable to the cure. The opacity of albugo in children, arising from severe ophthalmy after the small-pox, and remaining insulated in the centre of the transparent cornea, very often disappears in the course of a few months, even without the interference of art. Heister, Langguth, and Richter, have made the same observation. The event can only be imputed to the vigorous action of the lymphatics in children and to the organization of the cornea not being destroyed. To promote this absorption, Scarpa has found the following collyrium a most efficacious one: ℞. *Ammon. muriatæ.* ℈ij. *Cupri acetati* gr. iv. *Aquæ Calcis* ℥viij *Misce.* To be filtered, after standing twenty-four hours.

He praises also this ointment: ℞. *Tutiæ præpar.* ʒj. *Aloes. s. p.* gr. ij. *calomelanos* gr. ij. *Adipis suillæ.* ℥ss. *Misce.* And the *unguentum ophthalmicum* of Janin. He mentions the gall of the ox, sheep, pike, and barbel, applied to the cornea, two or three times a day, with a small hair pencil, if too much irritation should not be produced. In some subjects, when the eyes are very irritable, and cannot bear the latter applications, Scarpa has found the oil of walnuts, when rather rancid, very beneficial; two or three drops being insinuated into the eye, every two hours, for some months. In others, he has found the juice of the lesser centaury, mixed with honey, of service.

It is generally necessary to persevere very strictly, for at least three or four months, before the case can be reckoned incurable.

All the expedients, proposed for the inveterate albugo or leucoma from a cicatrix, consisting of scraping or perforating the layers of the cornea, and exciting ulceration there, are unavailing. For, though the enlargement of the cornea should be lessened by such means, its diaphanous state could not be restored; or should the patient perceive a ray or two of light immediately after the operation, the benefit would only be transient; for, as soon as the wound had healed, the opacity would recur. The formation of an artificial ulcer might prove useful, did leucoma depend on a mere extravasation of lymph; but, the fact is, the disease arises from the deposition of an opaque substance, and the disorganization of the texture of the cornea, conjointly; in this lies the difference between albugo and leucoma.

See *Scarpa sulle Malattie degli Occhi. Venezia;* 1802. *Richter's Anfangsgrunde der Wundarzn. Band* 3. *Essays on the Morbid Anatomy of the Eye, by J. Wardrop; Edinb.* 1808: *chap.* 11.

**LIGATURE.** (from *ligo*, to bind.) In the article *Hemorrhage*, we have noticed, that the immediate effect of a tight ligature on an artery, is to cut through its middle and internal coats, a circumstance, that tends very much to promote the adhesion of the opposite sides of the vessel to each other. Hence, the form and mode of applying a ligature to an artery should be such as are most certain of dividing the above coats of the vessel, in the most favourable manner. A broad flat ligature does not seem likely to answer this purpose in the best manner; because it is scarcely possible to tie it smoothly round the artery, which is very apt to be thrown into folds, or to be puckered by it, and, consequently, to have an irregular bruised wound made in its middle and internal coats. (*Jones.*) A ligature of an irregular form is likely to cut through these coats more completely at some parts than others; and if it does not perfectly divide them, no adhesion can take place, and secondary hemorrhage will follow. A fear of tying the ligature too tight may often lead to the same consequences. These, and many other important circumstances, are noticed in the article *Hemorrhage*.

Ligatures are commonly made of inkle, waxed together with white wax. They should be round, and very firm, so as to allow being tied with some force, without risk of breaking. (See *Jones on Hemorrhage, p.* 172.)

The principles, which should guide the surgeon in the use of the ligature, were not known, until the late Dr. Jones published his valuable treatise on hemorrhage. As an able surgeon has observed: " he has banished the use of thick and broad threads, of tapes, of reserve ligatures, of cylinders of cork and wood, linen compresses, and all the contrivances, which, employed as a security against bleeding, only served to multiply the chances of its occurrence." (*Lawrence in Medico-Chir. Trans. Vol.* 6, *p.* 162.)

In the article *Amputation*, I have noticed the method of cutting off both ends of the ligature close to the knot, on the face of the stump, with a view of lessening the quantity of extraneous matter in the wound, and promoting a complete union of the divided parts, without any suppuration. This plan has been tried by Mr. Lawrence: " The method I have adopted (says this gentleman) consists in tying the vessels *with fine silk ligatures*, and cutting off the ends as close to the knot as is consistent with its security. Thus the foreign matter is reduced to the insignificant quantity, which forms the noose actually surrounding the vessel, and the knot, by which that noose is fastened. Of the silk, which I commonly employ, a portion, sufficient to tie a large artery, when the ends are cut off, weighs between $\frac{1}{50}$ and $\frac{1}{60}$ of a grain: a similar portion of the thickest kind I have tried, weighs $\frac{1}{20}$ of a grain, and of the slenderest $\frac{1}{100}$."

Mr. Lawrence states, that the kind of silk twist, which is commonly known in the shops by the name of dentist's silk, and which is used in making fishing-lines, is the strongest material, in proportion to its size, and therefore the best calculated for our purpose, which requires considerable force in drawing the thread tight enough to divide the fibrous and internal coats of the arteries. This twist is rendered very hard and stiff by means of gum, which may be removed by boiling it in soap and water; but, the twist then loses a part of its strength. The stoutest twist, which Mr. Lawrence has used, is a very small thread, compared with ligatures made of inkle. The quantity of such a thread, necessary for the noose and knot on the iliac artery, weighs $\frac{1}{20}$ of a grain; or, if the gum has been removed, about $\frac{1}{26}$. But, the finest twist, kept in the silk shops, is strong enough in its hard state, for any surgical purpose; and the noose and knot, according to Mr. Lawrence's statement, would not weigh $\frac{1}{40}$ of a grain.

It further appears, from the report of this gentleman on the subject, that there is no danger of these ligatures cutting completely through the vessel, as some surgeons have apprehended; and that, although he has not yet ascertained what becomes of the pieces of ligature after the wound is united, he has never seen abscess nor any other bad symptom occasioned by them. At the time, when Mr. Lawrence wrote, he had employed this method of securing the arteries in ten, or eleven amputations, in six operations on the breast, and in the removal of two testicles. The cases all did well, excepting a man who lost his thigh, and who died of an affection of the lungs. (See *Lawrence on a New Method of tying the Arteries in Aneurism, Amputation, &c. in Medico-Chir. Trans. Vol.* 6, *p.* 156, *&c.*)

The foregoing method was tried by myself in several amputations, which I performed in 1815 at Brussels, and in a larger number of cases by Staff-surgeon Collier. Our ligatures, however, though small, were not so small as those judiciously recommended by Mr. Lawrence; and, on this account, no accurate inferences can be drawn from our examples, which, however, as far as I could learn, were not at all unfavourable to the new method, no bad effects having followed.

This subject was mentioned by Mr. Guthrie, as follows: "Some military surgeons, both French and English, have lately adopted the practice of cutting off both ends of the ligatures, close to the knot on the artery; uniting the parts, if possible over them, and allowing the knots to find their way out as they can. The edges of the wound, in some instances, have united thoroughly in a few days, and when the knots have come off the ends of the arteries, they have caused small abscesses to be formed, which point at the nearest external surface, and are discharged with little uneasiness. I know, that many cases, treated in this manner, in the campaign of 1813, ended successfully, and healed in as short a time as the most favourable ones by the usual method; and at Montpellier, in June 1814, Mons. Delpech, Professor of Surgery in that university, shewed me at least twenty cases, in which he had, and was still practising this method with success. I have seen, however, in two, or three instances, some ill-looking abscesses formed by them, and I suspect some disagreeable consequences will ensue, if this practice be continued.

"I consider this improvement as very valuable in all cases, that will not unite by the first intention. The ligatures, if there be many, form into ropes, are the cause of much irritation, and are frequently pulled away with the dressings; by cutting them off, these evils are avoided, and the knots will come away with the discharge." (See *Guthrie on Gun-shot Wounds of the Extremities*, p. 93—94.)

With respect to the abscesses, which this gentleman saw produced by the method, it is properly observed by Mr. Lawrence, that as this statement is not accompanied by any description of the materials, or size of the ligature, nor by any details of the unfavourable cases, we cannot judge, whether the events alluded to are to be attributed to the method itself, or to the way in which it was executed. (See *Med. Chir. Trans. Vol.* 6, *p.* 171.)

M. Roux has tried the plan in three operations on the breast; the cases did well; and no ill consequences arose from the presence of the bits of thread under the cicatrix. (See *Relation d'un Voyage fait à Londres en* 1814, *ou Parallele de la Chirurgie, Angloise avec La Chirurgie Françoise; Paris*, 1815. *p.* 134—136.) Mr. Crampton's observations against the principles inculcated by the late Dr. Jones, I have endeavoured to shew the fallacy of, in another place. See *Hemorrhage.*

**LINIMENTUM AMMONIÆ FORTIUS.**—℞. Aq. ammon. pur. ℥j. Olei olivæ ʒij. Misce. Used for stimulating the surfaces of parts in which it is wished to excite the action of the absorbents. It is serviceable in removing indurations, stiffness of the joints, &c.

**LINIMENTUM CALCIS.**—℞. Aquæ calcis, Olei olivæ, sing. ℥viij. Spirit. vinosi rectificati ℥i. Misce.—A common application to burns and scalds.

**LINIMENTUM CAMPHORÆ COMPOSITUM.**—℞. Camph. ℥ij. Aq. ammon. ℥vj. Spirit. lavend. ℥xvj. Sixteen ounces are to be distilled of the two last ingredients, from a glass retort, and the camphor then dissolved in the distilled fluid.—For bruises, sprains, rigidities of the joints, incipient chilblains, &c.

**LINIMENTUM CAMPHORÆ ÆTHEREUM.**—℞. Camphoræ drach. j. Ætheris unc. ss. Olei viperarum drach. ij. Misce. The camphor is to be dissolved in the æther, and the oil afterwards incorporated with it.

This formula, communicated by Mr. Ware, is adapted to those obscure affections of the eye, in which it is not easy to determine, whether the imperfection of the sight proceeds from an incipient cataract, or a defect of sensibility in the optic nerve.

The mode of applying it is to moisten the finger with it, and to rub it for two or three minutes together, morning and evening, on the outside and edges of the eyelids. (*Pharm. Chirurgica.*)

**LINIMENTUM HYDRARGYRI COMPOSITUM.**—℞. Ung. hydrargyri fortioris, Adipis suillæ, sing. ℥j. Camph. ʒij. Spirit. vinos. rectif. ʒij. Aq. ammon. pur. ℥j.—The camphor being dissolved in the spirit of wine, add the aq. ammon. and the ointment previously blended with hogs lard. (*Pharm. Sancti Barthol.*) A truly excellent formula for all surgical cases, in which the object is to quicken the action of the absorbents, and gently stimulate the surfaces of parts. It is a capital application for diminishing the indurated state of particular muscles, a peculiar affection every now and then met with in practice; and it is particularly well calculated for lessening the stiffness and chronic thickening often noticed in the joints.

**LINIMENTUM POTASSÆ SULPHURETI.**—℞. Saponis Albi. ℥iv. Olei Amygdalæ ℥viij. Potassæ Sulphureti ʒvj. Olei Thymi gr. xv. vel ℈j. This liniment, used twice a day will cure the itch in five days, or, at latest, in eight. It has very little unpleasant smell, and would be preferable to sulphur ointment, if equally efficacious. (See *London Medica*

*Repository, Vol.* 3, *p.* 242, *and Cross's Sketches of the Medical Schools of Paris, p.* 176.)

**LINIMENTUM SAPONIS COMPOSITUM.**—℞. Sapon. ℥iij. Camph. ℥j. Spirit. rorismar. ℔j. Dissolve the soap in the spirit, and then add the camphor.—Uses the same as those of the linimentum camph.

**LINIMENTUM SAPONIS CUM OPIO.** ℞. Lin. sapon. comp. ℥vj. Tinct. opii ℥ij. Misce.—For dispersing indurations and swellings attended with pain, but no acute inflammation.

**LINIMENTUM TEREBINTHINÆ.** ℞. Ung. resinæ flavæ ℥iv. Ol. terebinthinæ, q. s. Misce. The celebrated application for burns, recommended by Kentish. (See *Burns.*).

**LINIMENTUM TEREBINTHINÆ VITRIOLICUM.**—℞. Olei olivæ ℥x. Ol. terebinth. ℥iv. Acidi vitriol. ʒiij. Misce.—Said to be efficacious in chronic affections of the joints, and in the removal of long existing effects of sprains and bruises.—(*Pharm. Chirurgica.*)

**LIP, CANCER OF.** The lips are subject to ulcers, which put on a very malignant aspect, although they are not in reality malignant; and many of these, occurring just on the inside of these parts, will be found to depend on the bad state of the constitution, and the irritation and disturbance which the sores are continually suffering from the incessant motion of the parts, and their rubbing against a projecting, or rough tooth.

When cancer takes place, it is usually in the lower, and very seldom in the upper lip.

The disease sometimes puts on the appearance of an ulcerated, wart-like excrescence, occasionally acquiring a considerable size. Sometimes it is seen in the form of a very destructive ulcer, which consumes the surrounding substance of the lip; and, in other examples, the disease resembles a hard lump, which, at length, ulcerates. The disease, in its infancy, is often no more than a pimple, which gradually becomes malignant. Whenever there is reason to believe, that the disease is of an unyielding cancerous nature, the sooner it is extirpated the better. For this purpose, some surgeons admit the propriety of using caustic, when the whole disease can be completely destroyed by one application. But, as the action of caustic is not capable of being regulated with so much precision as the extent of a wound can be, and as caustic will not allow the parts to be united again, the knife is the only justifiable means, especially as it occasions also less pain. Two incisions are to be made, meeting at an angle below, (supposing it to be the lower lip) and including the whole of the disease. The sides of the wound are then to be united by the twisted suture. (See *Hare-lip.*) When the affection is extensive, however, the surgeon is frequently necessitated to remove the whole of the lip, or too much of it to admit of the above plan being followed. This circumstance is particularly unpleasant, as the patient's spittle can only be prevented from continually running over his chin by some artificial contrivance. The deformity also is very great, and pronunciation and swallowing can only be imperfectly performed.

**LIPPITUDO.** (from *lippus*, blear-eyed.) *Bleareduess.* The ciliary glands, and lining of the eyelids, only secrete, in the sound state, a mere sufficiency of a sebaceous fluid to lubricate the parts in their continual motions. But, it sometimes happens, from disease, that this sebaceous matter is secreted in too great a quantity, and glues the eye-lids together during sleep, so that, on waking, they cannot be easily separated. Hence, the margin of the eye-lids becomes red all round, and the sight itself even weakened.

The best remedies are the unguentum hydrargyri nitrati, smeared, at night, on the edges and inside of the eye-lid with a hair pencil, after being melted in a spoon; the unguentum tutiæ, applied in the same way; and a collyrium, composed of ℈j. of zincum vitriolatum in ℥viij. of aquæ rosæ.

When alterative medicines are requisite, a grain of calomel may be exhibited daily, or a pill containing one grain of calomel, one of sulphur antimonii præcipitatum, and two of guaiacum, put together with soap.

Persons who have lippitudo and cataracts together, bear couching much better, than one would expect from the appearance of the eyes in that disease; and Mr. Hey never rejects a patient on this account, provided such state is habitual. (*Practical Observations, p.* 51.) Scarpa, however, recommends relieving the lippitudo before undertaking the operation, as we have explained in the article *Cataract.*

See *Chandler on the diseases of the Eyes, chap.* 8. *Scarpa sulle Malattie degli Occhi, p.* 244.

**LITHONTRIPTICS.** (from λιθος, a stone; and θρυπτω, to break.) Medicines for dissolving stones in the bladder. (See *Urinary Calculi.*)

**LITHOTOMY.** (from λιθος, a stone; and τεμνω, to cut.) The operation of cutting into the bladder, in order to extract a stone.

It has been correctly remarked, that no single operation of surgery has attracted so much notice, or had so much written upon it, as that of lithotomy. A full and minute account of the sentiments of every writer, who has treated of the subject, and a detail of the infinite variety of particular modes of making an opening into the bladder, would occupy as many pages as are allotted to the whole of this dictionary. It must be my endeavour, therefore, rather to describe what is most interesting and important, than pretend to offer an article which is to comprehend every thing.

May I be allowed to premise, that throughout the following columns, I suppose the reader to be already well informed of all that relates to the anatomy of the bladder and adjacent parts, and of the perineum. Without correct knowledge of this kind, a man must be presumptuous, indeed, to set himself up for a good lithotomist; and if he were to distinguish himself at all, it would only be by the murders, which he committed, while his successful feats, if he achieved any, could redound little to his honour, since every young student would soon find out, that they were not the effect of science, but of mechanical habit and imitation. I would particularly recommend every one, who wishes to understand well the anatomy of the pelvic viscera and perinæum, with a view to lithotomy, in the first place to dissect these parts himself, and then avail himself of the valuable instructions to be derived on the subject from Winslow's Anatomy; Le Dran's Parallèle des Tailles; Heister's Instit. Chirurg; Le Cat's Deuxième Recueil, planche 5 et 6; Haller's Inst. Med. of Boerhave, and Elem. Physiol. Tom. 5; Morgagni, Adversar. Anat. 3, p. 82, 97: Camper's plates; Sabatier's Anatomy; John Bell's Principles of Surgery; Deschamp's Traité Historique, &c. de l'Opération de la Taille, Tom. 1, p. 7, &c.

A few subjects, which are closely connected with the present, will be found in other parts of this dictionary. For instance, the nature of stones in the bladder will be considered under the head of *Urinary Calculi*, where also will be seen some observations on lithontriptics. The manner of searching for the stone, or as it is now more commonly expressed, of sounding, will be explained in the article *Sounding*.

Here I shall principally confine myself to the symptoms of the disease, and the chief methods of executing the much diversified operation of lithotomy.

### SYMPTOMS OF THE STONE.

The symptoms of a stone in the bladder are, a sort of itching along the penis, particularly at the extremity of the glans; and hence the patient frequently gets a habit of pulling the prepuce, which becomes elongated; frequent propensities to make water, and go to stool; great pain in voiding the urine, and difficulty of retaining it, and often of keeping the feces from being discharged at the same time; the stream of urine is liable to stop suddenly, while flowing in a full current, although the bladder is not empty, so that the fluid is expelled by fits, as it were; the pain is greatest towards the end of, and just after, the evacuation; there is a dull pain about the neck of the bladder, together with a sense of weight, or pressure, at the lower part of the pelvis; and a large quantity of mucus is mixed with the urine; and, sometimes, the latter is tinged with blood, especially, after exercise. (*Sharp, Earle, Sabatier.*)

Frequently (says Deschamps) a patient will have a stone in his bladder a long while without the occurrence being indicated by any symptom, or accident. Most commonly, however, the presence of the stone is announced by pain in the kidneys, more especially in adults and old persons, children scarcely ever suffering in this way, because in them the stone is hardly at all detained in the kidneys and ureters, but descends immediately into the bladder, the preceding tubes being in them more dilatable, and the rudiment, or nucleus of the stone smaller.

It seldom happens, that calculous patients void blood with their urine, before the symptoms and accidents, usually caused by the stone, have taken place. It is not till after the foreign body has descended into the bladder, acquired some size, and presented itself at the orifice of that viscus, that pain is occasioned, particularly, when the surface of the stone is unequal. The patient then experiences frequent inclination to make water, attended with pain. The jolting of a carriage, riding on horseback, and much walking, render the pain more acute. The urine appears bloody, and its course is frequently interrupted, and sabulous matter and particles of stone are sometimes discharged with it. The want to make water becomes more frequent and more insupportable. The bladder is irritated, and inflames; its parietes become thickened and indurated; and its diameter is lessened. A viscid, more or less tenacious matter is observed, in greater or lesser quantity, in the urine, and is precipitated to the bottom of the vessel. The urine becomes black and putrid, and exhales an intolerable alkalescent smell, which is perceived at the very moment of the evacuation, and is much stronger a little while afterwards. The patient can no longer use any exercise, without all his complaints being redoubled. Whenever he walks in the least, the urine becomes bloody; the pain about the hypochondria, which was dull in the beginning, grows more and more acute; the ureters and kidneys participate in the irritation with the bladder; they inflame and suppurate, and very soon the urine brings away with it purulent matter. The fever increases, and changes into one of a slow type; the patient loses his sleep and appetite; becomes emaciated and exhausted; and death at length puts a period to his misery. (See *Traité Historique et Dogmatique de l'Operation de la Taille par J. F. L. Deschamps, Tom. 1, p. 163; Paris,* 1796.)

It is acknowledged by all the most experienced surgeons, and judicious writers upon the present subject, that the symptoms of a stone in the bladder are exceedingly equivocal, and may be produced by several other disorders. "Pain in making water, and not being able to discharge the urine without the feces, are common consequences of irritation of parts about the neck of the bladder, from a diseased prostate gland, and other causes. The urine stopping in a full stream is frequently caused by a stone altering its situation, so as to obstruct the passage; but the same thing may happen from a tumour, or fungus in the bladder. I have seen an instance of this, where a tumour, hanging by a small pedicle, would sometimes cause obstruction, and by altering the posture, would retire, and give a free passage. The dull pain at the neck of the bladder, and the sensation of pressure on the rectum, are frequently owing to the weight of the stone, &c.; but these may proceed from a diseased enlargement of the prostate gland. Children generally, and grown persons frequently, are subject to a prolapsus ani, from the irritation of a stone in the bladder; but it will likewise be produced by any irritation in those parts." (*Earle.*) The rest of the symptoms are equally fallacious; a scirrhous enlargement of the os tincæ, and disease of the kidneys, may occasion a copious quantity of mucus in the urine, with pain, irritation, &c. "The least fallible sign (says Sir James Earle) which I have remarked, is the patient making the first portion of urine with ease, and complaining of great pain coming on when the last drops are expelled. This may readily be accounted for, from the bladder being at first defended from contact with the stone by the urine, and, at last, being pressed naked against it. But, to put the matter out of all doubt, and actually to prove the existence of a stone in the bladder, we must have recourse to the operation of sounding."

A stone in the ureter, or kidneys, or an inflammation in the bladder, from any other cause, will sometimes produce the same effects; but if the patient cannot urine, except in a certain posture, it is almost a sure sign the orifice is obstructed by a stone. If he finds ease by pressing against the perinæum with his fingers, or sitting with that part upon a hard body, there is little doubt the ease is procured by taking off the weight of the stone; or, lastly, if, with the other symptoms, he thinks he can feel it roll in his bladder, it is hardly possible to be mistaken; however, the only sure judgment is to be formed from searching. (*Sharp on the Operations.*)

An enlarged prostate gland is attended with symptoms resembling those of a stone in the bladder; but, with this difference, that the motion of a coach, or horse, does not increase the grievances, when the prostate is affected, while it does so in an intolerable degree in cases of stone. It also generally happens, that the fits of the stone come on at intervals; whereas, the pain from a diseased prostate is neither so unequal, nor so acute.—(*Sharp in Critical Enquiry, p.* 165, *Edit.* 4.)

Though, from a consideration of all the circumstances above related, the surgeon may form a *probable* opinion of there being a stone in the bladder, yet he must never presume to deliver a *positive* one, nor ever be so rash as to undertake lithotomy, without having greater reason for being certain that there is a stone to be extracted. Indeed, all prudent surgeons, for centuries past, have laid it down as an invariable maxim, never to deliver a decisive judgment, nor undertake lithotomy, without having previously introduced a metallic instrument, called a sound, into the bladder, and plainly felt the stone.

The two remarkable cases, which occurred within the last twelvemonth at St. Bartholomew's hospital, fully prove, that the operation ought never to be attempted, unless the stone can be *distinctly* felt with the sound or staff. In these examples, one of which I was a spectator of, not only the symptoms, but the feel, which the sound itself communicated when in the bladder, made the surgeons imagine, that there was a calculus, or, some extraneous body in this organ. The operation was consequently performed; but, in each case, no stone was found. These cases recovered, which may be considered as fortunate; because when the stone cannot be found, the disappointed operator is apt to persist in roughly introducing his fingers, and a variety of instruments, so long, in the hope of catching what cannot be got hold of, that inflammation of the bladder and peritoneum is more likely to follow, than when a stone is actually present, soon taken out, and the patient only a short time upon the operating table.

In a valuable practical work is recorded an instance, in which what is called, a horny cartilaginous state of the bladder made the sound communicate a sensation, like that arising from the instrument actually touching a stone, and the surgeon attempted lithotomy. This patient unfortunately died in 24 hours. (See *Desault's Parisian Chir. Journal, Vol.* 2, *p.* 125.)

However, were the symptoms most unequivocal, there is one circumstance which would always render it satisfactory to touch the stone with an instrument, *just* *before* venturing to operate; I mean the possibility of there actually being a stone in the bladder to-day, and *not to-morrow*. It is said, that stones are occasionally forced, by the violent contractions of the bladder, during fits of the complaint, between the fasciculi of the muscular coat of this viscus, together with a portion of the membranous lining of the part, so as to become what is termed encysted. The opening into the cyst is frequently very narrow, so that the stone is much bigger, than the orifice of the cyst, in consequence of which it is impossible to lay hold of the extraneous body with the forceps, and the operation would necessarily become fruitless. (*Sharp's Critical Enquiry, p.* 228, *Edit.* 4.)

In the article *Urinary Calculi*, I have noticed the probability of this having occurred in some of the instances, in which Mrs. Stevens's medicine was supposed to have actually dissolved the stone in the bladder; for, an encysted stone is not likely to be hit with the sound, nor to cause any inconvenience, compared with what a calculus, rolling about in the bladder, usually occasions.

It is noticed by Deschamps, that when the stone is lodged in an excavated corner of the bladder, in a particular cyst, or depression; when it projects but very little; when it cannot shift its situation in the bladder, so as to fall against the orifice of this viscus; and when it is also smooth, polished, and light; the patient may then have it a long while, without experiencing any afflicting symptoms. He may even live to an advanced age, if not without some degree of suffering, at most with such pain as is very supportable. Daily experience proves, that persons may live a considerable time, with one, two, or even three stones in the bladder, and, during the whole of their lives, have not the least suspicion of the existence of these foreign bodies.

According to Deschamps, this must have been the case of M. Portalieu, a taylor in the street Sepulchre. This individual, eighty years old, was frequently attacked with a retention of urine from paralysis, and had consulted Deschamps two years previously. This surgeon introduced a sound several times, and distinctly felt a stone in the bladder. The patient, however, never had any symptom of the disorder, not even up to the period when Deschamps was writing down the case in his excellent treatise. Very large and exceedingly rough stones have also been found in the dead bodies of certain persons, who had never complained of the symptoms of the disease. Thus, at the anatomical theatre of La Charité, Richerand found an enormous mulberry-stone in the bladder of a person, who died altogether of another disease, and never had any symptom, that led to the suspicion of the stone. (*Nosographie Chir. T.* 3, *p.* 530, *Edit.* 4.) But, cases of this kind must be extremely rare, because it is well known, that the pain, which a stone produces, is less in a ratio to its size, than to its shape and situation. A small stone, owing to its situation, may be more painful, than an enormous calculus, which fills the bladder, as is proved by the following case, by Deschamps.

Pochet, a watchmaker, until the age of 45, had never had any infirmity, except that of not being able to retain his water a long while. One day, while he was carrying a very heavy clock, he made some exertions, which, probably, by changing the situation of the calculus, caused at the instant an acute pain in the hypogastric region. Symptoms of the stone soon came on; the pain became intolerable; and the patient went into the Hôpital de la Charité. He was sounded; the stone was felt, and judged to be of considerable size. The incision in the neck of the bladder not sufficing for its extraction, the patient was put to bed again. The next morning, he was operated upon above the pubes by Frère Come, who extracted an oval calculus that weighed twenty-four ounces. The patient died four and twenty hours after this second operation. This case proves, then, that very large stones may lie in the bladder without occasioning any serious complaints, since the preceding patient apparently had had such a calculus a long time, without suffering inconvenience from it, and it seems likely, that he might have continued well still longer, had it not been for the accidental effort, which first excited the symptoms. (*Deschamps, in Traité Historique, &c. de la Taille, Tom.* 1, *p.* 166, 167.)

A priest, in whom Morand had ascertained the presence of a stone by sounding, could not be persuaded, that his case was of this nature. However, he bequeathed his body at his decease to the surgeons, and the examination of the bladder fully justified Morand's prognosis. The celebrated D'Alembert also died with a stone in his bladder, having always refused to be sounded. (*Richerand, Op. cit. T.* 3, *p.* 538.)

I shall next describe the various methods of cutting for the stone, beginning with the most ancient, called the *apparatus minor*, and ending with the modern proposal of employing a knife in preference to a gorget.

### OF THE APPARATUS MINOR, CUTTING ON THE GRIPE, OR CELSUS'S METHOD.

The most ancient kind of lithotomy was that practised upwards of two thousand years ago, by Ammonius, at Alexandria, in the time of Herophilus and Erasistratus, and by Meges, at Rome, during the reign of Augustus; and, being described by Celsus, is named, *Lithotomia Celsiana*. From cutting directly on the stone, fixed by the pressure of the fingers in the anus, it has been called, *cutting on the gripe,* a knife and a hook being the only instruments used. The appellation of the *lesser apparatus,* was given to it by Marianus, to distinguish it from a method which he described, called the *apparatus major,* from the many instruments employed.

The operation was done in the following way. The rectum was emptied by a glyster, a few hours previously; and, immediately before cutting, the patient was desired to walk about his chamber, to bring the stone down to the neck of the bladder; he was then placed in the lap of an assistant, or secured as now, in the lateral operation. The surgeon then introduced the fore and middle fingers of his left hand, well oiled, into the anus; while he, at the same time, pressed with the palm of his right hand on the lower part of the abdomen, above the pubes, to assist in bringing down the stone. With the fingers it was next griped, pushed forward toward the neck of the bladder, made to protrude, and form a tumour on the left side of the perinæum. The operator then took a scalpel, and made a lunated incision through the skin and cellular substance, directly on the stone, near the anus, down to the neck of the bladder, with the horns towards the hips. Then, in the deeper and narrower part of the wound, was made a second incision also transverse, into the neck of the bladder itself, till the flowing out of the urine shewed that the incision exceeded in some degree, the size of the stone. The calculus, being strongly pressed upon with the fingers, next started out of itself, or was extracted with a hook for the purpose. (*Celsus, lib. 7, cap. 26. J. Bell's Principles, Vol. 2, p. 42. Allan on Lithotomy, p.* 10.)

The objections to cutting on the gripe, are; the impossibility of always dividing the same parts; for, those which are cut will vary, according to the degree of force employed in making the stone project in the perinæum. When little exertion is made, if the incision be begun just behind the scrotum, the urethra may be altogether detached from the prostate: if the stone be much pushed out, the bladder may be entered beyond the prostate, and both the vesiculæ seminales and vasa deferentia inevitably suffer. Lastly, if the parts are just sufficiently protruded, the bladder will be cut upon its neck, through the substance of the prostate gland. (*Allan on Lithotomy. Burns, in Edinburgh Surgical Journal, No. XIII. J. Bell, Vol.* 2, *p.* 59.)

The preceding dangers were known to Fabricius Hildanus, who attempted to obviate them by cutting on a staff, introduced through the urethra into the bladder. He began his incision in the perinæum, about half an inch on the side of the raphe; and he continued the cut, inclining the knife, as he proceeded, towards the hip. He continued to divide the parts till he reached the staff; after which, he enlarged the wound to such an extent, as to permit him easily to extract the stone, which he had previously brought into the neck of the bladder, by pressure with the fingers in the rectum. He employed a hook to extract the stone. (*Burns.*) In this way Mr. C. Bell has operated with success. (*J. Bell.*)

The apparatus minor, as practised by Fabricius, with the aid of a staff, is certainly so simple and safe an operation for children, that we must lament its present utter neglected state. You cut, says an eminent writer, upon the stone, and make of course, with perfect security, an incision exactly proportioned to its size. There is no difficult nor dangerous dissection; no gorget, nor other dangerous instrument, thrust into the bladder, with the risk of its passing betwixt that and the rectum; you are performing, expressly, the lateral incision of Raw and Cheselden, in the most simple and favourable way. (*J. Bell.*) The *prisca simplicitas instrumentorum* seems, indeed, as the latter gentleman remarks, to have been forsaken, for the sake of inventing more ingenious and complicated operations.

Celsus has delivered one memorable precept in his description of lithotomy, *ut plaga paulo major, quàm calculus sit;* and he seems to have known very well, that there was more danger from lacerating, than cutting the parts.

The simplicity of the operation emboldened every quack to undertake its performance; and thus, by diminishing the emolument of regular practitioners, became the grand cause of its downfall. (See *Heister on this subject.*) It was longer practised, however, than all the other methods; and was performed at Bourdeaux, Paris, and other places in France, on patients of all ages, by Raoux, even as late as 140 years ago. Frere Jacques occasionally had recourse to it; and it was successfully executed by Heister. (*Part 2, chap.* 140.) A modern author recommends it always to be preferred on boys, under fourteen. (*Allan, p.* 12.)

### APPARATUS MAJOR.

So named from the multiplicity of instruments employed; or the Marian method, from having been first published by Marianus Sanctus, in 1524, as the invention of his master, Johannes de Romanis. (See *Marianus de lapide Vesicæ per incisionem extrahendo.*)

This operation, which came into vogue, as we have noticed, from avaricious causes, was rude and painful in its performance, and very fatal in its consequences. The apology for its introduction, was the declaration of Hippocrates, that *wounds of* *membranous parts are mortal.* It was contended, however, that such parts might be dilated with impunity; and, on this principle of dilatation, Romanis invented a complex and dangerous plan of operating; one very incompetent to fulfil the end proposed; one, which, though supposed only to dilate, really lacerated the parts. (*Burns.*)

The operator, kneeling on one knee, made an incision, with his razor, along the perinæum, on one side of the raphe; and, feeling with his little finger for the curve of the staff, he opened the membranous part of the urethra; and, fixing the point of the knife in the groove of his staff, gave it to an assistant to hold, while he passed a probe along the knife into the groove of the staff, and thus into the bladder. The urine now flowed out, and the staff was withdrawn. The operator next took two conductors, a sort of strong iron probes; one, named the female conductor, having in it a groove, like one of our common directors; the other, the male conductor, having a probe point, corresponding with that groove. The grooved, or female conductor, being introduced along the probe into the bladder, the probe was withdrawn, and the male conductor passed along the groove of the female one, into the bladder. Then commenced the operation of dilating. The lithotomist took a conductor in each hand, and, by making their shafts diverge, dilated, or, in plain language, tore open the prostate gland. (*J. Bell.*)

It would be absurd in us to trace the various dilating instruments, contrived for the improvement of this barbarous operation, by the Collots, Le Dran, Paré, &c. Among the numerous glaring objections to the apparatus major, we need only notice the cutting the bulb of the urethra, not dividing the membranous part of the urethra, nor the transversalis perinei muscle, which forms a kind of bar across the place where the stone should be extracted; the laceration of the neck of the bladder; frequent impotency afterwards, and extensive fatality.—Paré, Le Dran, Le Cat, Mery, Morand, Mareschal, Raw, and all the best surgeons in Europe, most strangely practised this rash method, for two hundred years, till Frere Jacques, in 1697, taught at Paris the original model of lithotomy, as commonly adopted at the present day.

### OF THE HIGH OPERATION.

This method of cutting for the stone, was first published in 1561, by Pierre Franco, who, in his Treatise on Hernia, says he once performed it on a child, with very good success, but discourages the farther practice of it. After him, Rossetus recommended it, with great zeal, in his book intitled *Partus Cæsarius*, printed in 1591; but he never performed the operation himself.—Monsieur Tolet makes mention of its having been tried in the Hôtel-Dieu, but without entering into the particular causes of its discontinuance, says only, that it was found inconvenient. About the year 1719, it was first done in England, by Mr. Douglas; and after him, practised by others. (*Sharp's Operations.*)

The patient being laid on a square table, with his legs hanging off, and fastened to the sides of it by a ligature, passed above the knee, his head and body lifted up a little by pillows, so as to relax the abdominal muscles, and his hands held steady by some assistants; inject through a catheter, into the bladder, as much barley-water as he can bear, which, in a man, is often about eight ounces, and sometimes twelve.

The bladder being filled, an assistant, in order to prevent the reflux of the water, must grasp the penis, the moment the catheter is withdrawn, holding it on one side, in such a manner as not to stretch the skin of the abdomen; then, with a round-edged knife, make an incision about four inches long, between the recti and pyramidal muscles, through the membrana adiposa, as deep as the bladder, bringing its extremity almost down to the penis; after this, taking a crooked knife, continue the incision into the bladder, carrying it a little under the os pubis; and immediately upon the water's flowing out, introduce the fore-finger of your left hand, which will direct the forceps to the stone. (*Sharp's Operations.*) Sabatier wisely condemns making the cut in the bladder from below upward, lest the knife injure the peritonæum. (*Méd. Opératoire, T.* 3, *p.* 160.)

Although this is one of the easiest, and, to all appearance, the safest method of operating, several objections soon brought it into disuse. 1. The irritation of a stone often causes such a thickened and contracted state of the bladder, that this viscus will not admit of being distended so as to rise above the pubes. 2. If the operator should break the stone, the fragments cannot be easily washed away, and remaining behind will form a nucleus for a future stone. 3. Experience has proved, that the high operation is very commonly followed by extravasation of urine, attended with suppuration and gangrenous mischief in the cellular membrane of the pelvis. This happens because the urine more readily escapes out of the wound in the bladder, than through the urethra; and also because when the bladder contracts, and sinks behind the os pubis, this wound ceases to be parallel to that in the linea alba and integuments, and becomes deeper and deeper. For the prevention of these ill consequences, says Sabatier, it will be in vain to make the patient lie in an horizontal posture, and to keep a catheter introduced, as Rousset and Morand recommended: experience has evinced, that the bad effects, which we have described, were neither less frequent, nor less fatal. (See *Médecine Opératoire, T.* 3, *p.* 161, *Edit.* 2.) 4. The danger of exciting inflammation of the peritonæum. 5. The injection itself is exceedingly painful, and, however slow the fluid be injected, the bladder can seldom be dilated enough to make the operation absolutely secure; and, when hastily dilated, it is sometimes even burst, or, at least, its tone destroyed. We need not enumerate other inconveniences. (See *Sharp, Allan, Sabatier, &c.*)

Some of the objections, however, do not apply to certain instances. In many men, we know by searching, that their bladder is very large, so that we can run no risk of meeting with it in a contracted state, and, therefore, the objection is of no weight, when we are certain, that the bladder extends itself a considerable way above the pubes, and will admit a large quantity of injection. Stones are sometimes known to be of large size, and they are less likely to be broken in this, than any other mode of lithotomy, so that the objection of the difficulty of extracting small calculi and fragments, is less forcible. The excoriations, from the effusion of urine all over the skin near the wound, may be prevented by embrocations, ointment, &c. The abscesses and gangrenes, arising from the extravasation of urine in the cellular substance, says an able surgeon, may be very much prevented by the introduction of a cannula, as practised in the puncture of the bladder above the os pubis. (*Sharp in Critical Enquiry.*

This celebrated surgeon remarks, in the same chap. 1, that he should not be surprised, if hereafter, on particular occasions, the high operation were revived and practised with success.

To this observation of Mr. Sharp's, I may add, that many judicious surgeons of the present day are decidedly of opinion, that when a stone in the bladder is known to be very large, no attempt ought ever to be made to extract it from the perinæum. Professor Scarpa also declares, that the lateral operation should not be practised, when the calculus exceeds twenty lines in its small diameter. (See *Memoir on the Cutting Gorget of Hawkins, p.* 8, *trans. by Briggs.*) In such cases, it is true, the surgeon might do the lateral operation, and try to break the stone. But no doubt many surgeons would prefer to this unpleasant, unsatisfactory, proceeding the high operation, and I am inclined to be of this number myself. I speak particularly of cases, in which the stone is known to be of very large dimensions before any operation is begun. Were the lateral operation commenced, the stone, if too large for extraction, must of course be broken; for, it is then too late to adopt the high operation. I heard lately, however, of a French surgeon, who began with the lateral operation, but, finding a large calculus, ended with performing the high operation, without the least delay, or hesitation. The patient died; nor, according to my notions, could a better fate have been rationally expected.

### LATERAL OPERATION.

So named from the prostate gland, and neck of the bladder, being laterally cut.

It was invented by an ecclesiastic, who called himself Frere Jacques: he came to Paris in 1697, bringing with him abundance of certificates of his dexterity in operating; and making his history known to the court and magistrates of the city, he got an order to cut at the Hôtel-Dieu, and the Charité, where he performed this operation on about fifty persons. His success did not answer the promises he had made, and from that time his reputation seems to have declined in the world, if we may give credit to Dionis, who has furnished us with these particulars.—(*Sharp's Operations.*)

Frere Jacques used a big round staff without a groove, and when it was introduced into the bladder, he depressed its handle, with an intention of making the portion of this viscus, which he wished to cut, approach the perinæum. He then plunged a long dagger-shaped knife into the left hip, near the tuber ischii, two fingers breadth from the perinæum, and pushing it towards the bladder, opened it in its body, or as near the neck as he could, directing his incision upward from the anus. He never withdrew his knife, till a sufficient opening was made for the extraction of the stone. He used sometimes a conductor to guide the forceps, but more commonly, directed them with his finger, which he passed into the wound after withdrawing the knife. When he had got hold of the stone, he used to draw it out in a quick rough manner, heedless of the bad consequences. His only object was to get the stone extracted, and he disregarded every thing else; all preparatory means, all dressings, all after treatment. (*Allan, p.* 23.)

Totally ignorant of anatomy, and thus rude and indiscriminate in practice, Frere Jacques soon sunk into disrepute. However, there were several eminent surgeons, who conceived, from considering the parts, which he cut, that his method might be converted into a most useful operation. (*Sharp's Operations.*)

The principal defect, in his first manner of cutting, was the want of a groove in his staff, which made it difficult to carry the knife into the bladder. At length, Frere Jacques was prevailed upon to study anatomy, by which his judgment being improved, he readily embraced several improvements, which were suggested to him. Indeed, we are informed, that he now succeeded better, and knew more, than is generally imagined. Mr. Sharp says, that when he himself was in France in 1702, he saw a pamphlet, published by this celebrated character, in which his method of operating appeared so much improved, that it scarcely differed from the practice of that time. Frere Jacques had learnt the necessity of dressing the wound after the operation, and had profited so much from the criticisms of Mery, Fagon, Felix, and Hunauld, that he then used a staff with a groove, and, what is more extraordinary, had cut thirty-eight patients successively, without losing one. (*Sharp's Operations.*)

In short, as a modern writer has observed, he lost fewer patients, than we do at the present day, in operating with a gorget. He is said to have cut nearly 5000 patients in the course of his life, and, though persecuted by the regular lithotomists, he was imitated by Mareschal at Paris, Raw in Holland, and by Bamber, and Cheselden in England, where his operation was perfected.—(*Allen.*)

For a particular history of Frere Jacques, and his operations, Allan refers us to *Bussiere's Letter to Sir Hans Sloane, Philos. Trans.* 1699. *Observations sur la Maniere de tailler dans les deux Sexes, pour l'Extraction de la Pierre, pratiquée par F. Jacques, par J. Mery. Lister's Journey to Paris in* 1698. *Cours d' Operations de Chirurgie, par Dionis. Garengeot's Traité des Operations, Tom.* 2. *Morand, Opuscules de Chirurgie, Part* 2.

Among the many, who saw Frere Jacques operate, was the famous Professor Raw, who carried his method into Holland, and practised it with amazing success. He never published any account of it himself, though he admitted several to his operations; but, after his death, his successor Albinus, gave the world a very circumstantial detail of all the processes, and mentions, as one of Raw's improvements, that he used to open the bladder, between the neck and the ureter. But, either Albinus, in his relation, or Raw himself in his supposition, was mistaken; since it is almost impossible to cut the bladder in that part upon the common staff, without also wounding the neck. (*Sharp in Operations, and Critical Enquiry.*)

Raw's method was objectionable, even when accomplished, as the urine could not readily escape, and became extravasated around the rectum, so as to produce terrible mischief. There is little doubt, that Raw's really successful plan, was only imitative of Frere Jacques's second improved one, though he was not honourable enough to confess it. (See *Ferhius de Calculo Vesicæ.*)

Dr. Bamber was the first man in England, who made a trial of Raw's method on the living subject, which he did in St. Bartholomew's Hospital. Cheselden, who had been in the habit of practising the high operation, gladly abandoned it, on receiving the account of Raw's plan and success, and, a few days after Bamber, he began to cut in this way in St. Thomas's Hospital.

Cheselden used at first to operate in the following manner. The patient being placed, and tied much in the same way, as is done at this day, the operator introduces a hollow grooved steel catheter into the bladder, and with a syringe, mounted with an ox's ureter, injects as much warm water into it, as the patient can bear without pain. The water being kept from running out by a slip of flannel tied round the penis, the end of the cathether is to be held by an assistant, whose principal care is to keep it from rising, but not at all to direct the groove to the place, where the incision is to be made.

With a pointed convex-edged knife, the operator beginning about an inch above the anus, on the left side of the raphe, between the accelerator urinæ, and erector penis, makes an incision downwards, by the side of the sphincter ani, a little obliquely outwards as it descends, from two and a half to four inches in length, according to the age of the patient, or size and structure of the parts. This incision, he endeavours to make all at one stroke, so as to cut through the skin, fat, and all, or part, of the levator ani, which lies in his way. This done, he passes his left fore-finger into the middle of the wound, in order to press the rectum to one side, that it may be in less danger of being cut; and taking a crooked knife in his other hand, with the edge on the concave side, he thrusts the point of it through the wound, close by his finger, into the bladder, between the vesicula seminalis and os ischium of the same side. This second incision is continued upwards, till the point of the knife comes out at the upper part of the first. The incision being completed, the operator passes his left fore-finger through the wound into the bladder, and having felt, and secured the stone, he introduces the forceps, pulls out his finger, and extracts the stone.

As the bladder was distended, Cheselden thought it unnecessary to cut on the groove of the staff, and that, as this viscus was sufficiently pressed down by the instrument, the forceps could be very well introduced without the use of any director, except the finger. (*Postscript to Douglas's History of the Lateral Operation.* 1726.)

With respect to this first of Cheselden's plans, Sharp says, the operations were exceedingly dexterous; but the wound of the bladder retiring back, when it was empty, did not leave a ready issue for the urine, which, insinuating itself among the neighbouring muscles and cellular substance, destroyed four of the ten that he practised it upon, and some of the others narrowly escaped. (*Sharp's Operations.*)

Cheselden, finding that he lost so many of his patients, in imitating Raw, according to the directions given by Albinus, began to adopt a new manner of operating, founded on the anatomy of the parts, which he thus describes: "I first make as long an incision as I well can, beginning near the place, where the old operation ends, and cutting down between the musculus, accelerator urinæ and erector penis, and by the side of the intestinum rectum: I then feel for the staff, and cut upon it the length of the prostate gland straight on to the bladder, holding down the gut all the while with one, or two fingers of my left hand." (*Anatomy of the Human Body, Edit.* 1730.)

It deserves to be remarked, it was Cheselden's second manner of cutting, that has been described in the *Opuscules de Chirurgie*, of M. Morand, who was deputed, and had his expences defrayed, by the Royal Academy of Sciences in Paris, to come over to England, and learn from Mr. Cheselden himself, his way of operating for the stone; and accordingly, we find, that most French authors, taking their account from M. Morand, describe Mr. Cheselden's second, not his third operation, as that which he invented, and bears his name. But, that Mr. Cheselden never resumed his second manner of cutting, may be inferred from his continuing to describe the third only in all the editions of his anatomy published after 1730. (*See a note by J. Thomson, M. D. annexed to his new edition of Douglas's Appendix. Edinburgh,* 1808.)

The instruments, which Cheselden employed in his third, and most improved, mode of cutting for the stone, were a staff, an incision knife, a gorget, a pair of forceps, and a crooked needle carrying a waxed thread. The patient being placed on a table, his wrists are brought down to the outsides of his ankles, and secured there by proper bandages, his knees having first been bent, and his heels brought back near his buttocks.

Mr. Cheselden used then to take a catheter, first dipped in oil, and introduce it into the bladder, where having searched for, and discovered the stone, he used to give the instrument to one of his colleagues, whom he desired to satisfy himself, whether there was a stone, or not. The assistant, standing on his right hand, held the handle of the staff between his fingers and thumb, inclined it a little towards the patient's right thigh, and drew the convex side close up to the os pubis, in order to remove the urethra as far as possible from the rectum.

The groove of the staff being thus turned outwardly and laterally, Cheselden used to sit down in a low chair, and, keeping the skin of the perinæum steady with the thumb and forefinger of his left hand, he made the first, or outward incision, through the integuments, from above downwards, beginning on the left side of the raphe, between the scrotum and verge of the anus, almost as high up as where the skin of the perinæum begins to form the bag containing the testicles. Thence, he continued the wound obliquely outwards, as low down as the middle of the margin of the anus, at about half an inch distant from it near the skin, and, consequently, beyond the tuberosity of the ischium. He was always careful to make this outward wound as large as he could with safety. Having cut the fat rather deeply, especially near the rectum, he used to put his left forefinger into the wound, and keep it there till the internal incision was quite finished; first to direct the point of his knife into the groove of his staff, which he now felt with the end of his finger, and likewise to hold down the rectum, by the side of which his knife was to pass, and so prevent its being wounded. This inward incision Cheselden made with more caution, than the former. His knife first entered the groove of the rostrated, or straight part of the catheter, through the sides of the bladder, immediately above the prostate, and, afterwards, the point of it continuing to run in the same groove in a direction downwards, and forwards, or towards himself, he divided that part of the sphincter of the bladder, which lies upon that gland, and then he cut the outside of one half of it obliquely, according to the direction and whole length of the urethra, that ran within it, and finished his internal incision, by dividing the muscular portion of the urethra, on the convex part of his staff.

A sufficient opening being made, Cheselden used to rise from his chair, his finger still remaining in the wound. Next he put the beak of his gorget in the groove of the staff, and then thrust it into the bladder. The staff was now withdrawn, and, while he held the gorget with his left hand, he introduced the forceps, with the flat side uppermost, sliding them with great caution along the concavity of the gorget. When they were in the bladder, he withdrew the latter instrument, and taking hold of the two branches of the forceps with both his hands, he searched gently for the stone, having them still shut. As soon as this was felt, he used to open them, and try to get the lower blade under the stone, that it might fall more conveniently into their chops, and be laid hold of. This being done, the stone was extracted with a very slow motion, in order to give the parts time to dilate, and the forceps were gently turned in all directions.

When the stone was very small, and did not lie well in the forceps, Cheselden used to withdraw them, and introduce his finger into the bladder, in order to try to turn the stone, and disengage it from the folds of the lining of the bladder, in which it was sometimes entangled. Then the gorget was passed in again on the upper side of his finger, and turned as soon as the latter was pulled out. Lastly; the forceps were introduced, and the stone extracted.

To preserve a soft stone from breaking, during its extraction, he used to put one or more of his fingers between the branches of his forceps, so as to prevent any greater pressure upon it than what was just necessary to hold it together. But, when it did break, or there were more than one, he used to extract the single stones, or fragments, one after another, repeating the introduction of his fingers and forceps, as often as there was occasion. Cheselden took care not to thrust the forceps so far into the bladder as to bruise or wound its opposite side; and he was equally careful not to pinch any folds of its inner coat. In this way, Cheselden saved 50 patients out of 52, whom he cut successively in St. Thomas's Hospital. (*Appendix to the History of the Lateral Operation, by J. Douglas.* 1731.)

Cheselden with all the enthusiasm of an inventor, believed, that he had discovered an operation, which was not susceptible of improvement; yet, he himself changed the manner of his incision no less than three times in the course of a few years. 1st, He cut into the body of the bladder, behind the prostate, when he imitated Raw. 2dly, He cut another part of the bladder, viz. the neck and the thick substance of the prostate; this is his lateral mode of incision. 3dly, He changed a third time, not the essential form of the incision, but, the direction, in which he moved the knife; for, in his first operation, when imitating the supposed operation of Raw and Frere Jacques, he struck his knife into the body of the bladder, betwixt the tuber ischii, and the vesiculæ seminales, and all his incision lay behind the prostate gland. In his second operation, he struck his knife into the membranous part of the urethra, immediately behind the bulb, and ran it down through the substance of the gland; but, his incision stopped at the membranous part, or body, of the bladder. But, in his third operation, he, after very large external incisions, struck his knife deeply into the great hollow under the tuber ischii, entered it into the body of the bladder immediately behind the gland, and, drawing the knife towards him, cut through the whole substance of the gland, and even a part of the urethra, "cutting the same parts the contrary way." By carrying the forefinger of the left hand before the knife, in dissecting towards the body of the bladder, he protected the rectum more perfectly, than he could do in running the knife backwards along the groove of the staff; and by striking his knife into the body of the bladder and drawing it towards him, through the whole thickness of the gland, he was sure to make an ample wound. (*J. Bell's Principles of Surgery, Vol. 2, Part 1, p. 152.*)

### LATERAL OPERATION AS PERFORMED AT THE PRESENT DAY WITH CUTTING GORGETS.

The gorget is the same instrument as the conductor used by Hildanus; but, having a cutting edge; and it was used in the Marian operation as a dilator and conductor for the forceps. Sir Cæsar Hawkins thought, that, when its right side was sharpened into a cutting edge, it might be pushed safely into the bladder, guided by the staff, and make the true lateral incision, in the left side of the prostate gland, more easily, and with less risk of injuring the adjacent parts, than Cheselden could do with the knife, and surgeons were pleased with a contrivance, which saved them from the responsibility of dissecting parts, with the anatomy of which all were not equally well acquainted. (*J. Bell. Allan.*)

As Scarpa observes: To render the execution of the lateral operation easier to surgeons of less experience, than Cheselden, was the laudable motive, which induced Hawkins to propose his gorget. He thought, that two great advantages would be gained by the use of this instrument; one, for instance, of executing invariably the lateral incision of Cheselden; the other, of constantly guarding the patient, through the whole course of the operation, from injury of the rectum, and of the arteria pudica profunda. The utility of the latter object (says Scarpa) cannot be disputed, as it is evident, that *the convexity of the director of the instrument defends the rectum from injury,* and that *its cutting edge not being inclined horizontally, towards the tuberosity and ramus af the ischium, but, turned upwards in the direction of the longitudinal axis of the neck of the urethra, cannot wound the pudic artery.* But, with respect to the first advantage, or that of executing precisely the lateral incision of Cheselden, it must be admitted, that it does not completely fulfil the intention, which he proposed, not only on account of the cutting edge of his instrument not being raised enough above the level of the staff, to penetrate sufficiently the substance of the prostate gland, and consequently to divide it to a proper depth; but, because being too much turned upwards, at that part of it, which is to lay open the base of the prostate gland, it does not divide it laterally, but rather at its upper part, towards the summit of the ramus of the ischium, and the arch of the pubes; an opening, of all others, in the perinæum, the most confined, and presenting the greatest impediment to the passage of the stone from the bladder. The breadth of the point of the director, is, besides, so disproportionate to the diameter of the membranous part of the urethra, that, from the great resistance, with which it meets, the instrument may easily slip from the groove of the staff, and pass between the bladder and rectum, *a serious accident, which has very often happened even in the hands of experienced surgeons.*

Scarpa considers all the modifications of Hawkins's gorget, proposed by B. Bell, Desault, Cline, and Cruikshanks, as deteriorations of the original instrument. B. Bell, (says Scarpa) has diminished the breadth of the director, but has given the cutting edge an horizontal direction. The horizontal direction of the cutting edge is also preferred by Desault, Cline, and Cruikshanks; but, they have enlarged the director, and flattened the part, which was previously concave. Aware of the danger of wounding the pudic artery, by the horizontal direction of the gorget, they direct the handle of the staff to be inclined towards the patient's right groin, and the gorget to be pushed along it, inclined in such a manner, that its obtuse edge may be directed towards the rectum, and its cutting edge placed at a sufficient distance from the tuberosity and ramus of the ischium to avoid wounding the artery. Scarpa contends, however, that it is difficult to give a proper degree of obliquity to the staff, and that such inclination of the instrument must be incommodious, arbitrary, and unstable, in comparison with that position of it, in which the handle of the staff is held in a line perpendicular to the body of the patient, and its concavity placed against the arch of the pubes; on which stability of the instrument (says Scarpa) the safety and precision of the lateral operation depend. According to this eminent professor, the defects of Hawkins's original gorget arise from the excessive breadth of the director, particularly at the point; the want of sufficient elevation of the cutting edge, above the level of the groove of the staff, and the uncertain inclination of the edge to the axis of the urethra and prostate gland. The cervix of the urethra, in a man between thirty and forty years of age, is only three lines in diameter at the apex of the prostate gland, four lines in its centre, and five near the orifice of the bladder. The apex of the prostate gland is rather more than two lines in thickness, the body or centre four, and the base six and sometimes eight, which surrounds the orifice of the bladder. In an adult of middle stature, from eighteen to twenty years of age, the thickness of the base of the prostate gland is about two lines less, compared with that of a man of forty, and of a large size. The precise line in which the lateral incision of the prostate gland should be made in an adult, (says Scarpa) is found to be inclined to the longitudinal axis of the cervix of the urethra, and of the gland itself, at an angle of 69°. Now, from these data, drawn from the structure of the parts, Scarpa makes the director of his gorget only four lines broad, and two deep; the breadth decreasing at the beak. The cutting edge of the instrument is straight near its point, but gradually rises, and becomes convex above the level of the staff, so that its greatest convexity is seven lines broad. Lastly; the inclination of the cutting edge to the longitudinal axis of the director, is exactly at an angle of 69°; that is to say, the same as the left side of the prostate gland to the longitudinal axis of the neck of the urethra. (See *Scarpa's Memoir on Hawkins's Gorget; transl. by Mr. Briggs, p.* 12. 17.)

It is but justice to state, that, for nearly twenty years past, the instrument-makers have commonly sold in the shops a gorget, which Mr. Abernethy first had constructed, and which in the particularity of having its cutting edge turned up at an angle of 45° bears much analogy to the instrument lately recommended by Scarpa. The cutting edge is straight, and that useless and dangerous part of a gorget, commonly called the shoulder, is removed. Admitting that the principles of the lateral operation, as inculcated by Scarpa, are correct, and of which I shall presently speak, it appears to me, that Mr. Abernethy's gorget is far preferable to that very recently proposed by Scarpa. Its edge is not so immoderately turned up, and it will enter with more ease, and less risk of slipping from the staff, because it has not any projecting shoulder, which, while the staff is firmly held with the beak of the gorget in it, can have no other effect but that of obstructing the passage of the last instrument.

Gorgets, which cut on both sides, have also been sometimes employed in England, and, as a larger opening can be obtained by them, even without trespassing the limits of the incision, fixed by Scarpa, that is to say, without cutting any part of the fundus of the bladder, they appear to promise utility, especially when the stone is suspected to be rather large. I believe, however, that they are less used now, than they were some years ago, when Mr. A. Cooper sometimes employed them in Guy's Hospital; but, I am unacquainted with the particular reasons of this change.

Some criticisms on Scarpa's method of operating, and a few remarks on the most advantageous size and direction of the lateral incision, will be found in a separate section of the present article.

When the patient is of a plethoric habit, 16, or 20 ounces, of blood should be taken from his arm two days before the operation; a brisk purge administered the preceding day; and a clyster injected a couple of hours before cutting, in order to empty the rectum, and render it less liable to be wounded. It is to be lamented, that these prudent steps are so often neglected.

As it is advantageous to have the bladder somewhat distended with urine, the patient should be requested to retain it a certain time before being cut. Formerly, a jugum penis was sometimes used for confining the urine in the bladder; but, since my entrance into the profession, I have never heard of this contrivance being employed by any of the surgeons of the metropolis.

Before the operation, the following instruments should all be arranged ready on a table: a staff of suitable size, and the groove of which should be closed at the extremity; a sharp gorget, with a beak nicely and accurately adapted to the groove of the preceding instrument, so as to glide easily and securely; a large scalpel for making the first incisions; forceps of various sizes, for extracting the stone; a blunt-pointed bistoury for enlarging the wound in the prostate, if the incision of the gorget is not sufficiently large, as the parts should never be lacerated; a pair of Le Cat's forceps with teeth for breaking the stone, if too large to come through any wound reasonably dilated; a syringe for washing out clots of blood, or particles of the stone; a scoop for the removal of small calculi or fragments; two garters to tie the patient's hands to his feet.

The curvature of the staff is a matter of considerable importance; because the direction of the incision through the prostate gland and neck of the bladder is in a great measure determined by it. The French surgeons, convinced of the advantage of introducing the gorget in the direction of the axis of the bladder, always use a staff, which is much more curved than what English surgeons employ. (See *Roux, Voyage fait à Londres en 1814, ou Parallèle de la Chir. Angloise, &c. p.* 319.) But, I am inclined to believe with Scarpa, that, upon the whole, it is best to let the curvature of the staff correspond exactly to that of the axis of the neck of the urethra and prostate gland. (*Memoir on Hawkins's Gorget, &c. p.* 17.)

After introducing the staff, and feeling that the stone is certainly in the bladder, the patient is to be secured in the same position, as we described in the account of Cheselden's latest method of operating.

The assistant, holding up the scrotum, with his left hand, is with his right to hold the staff, inclining its handle towards the right groin, to make the grooved convexity of the instrument turn towards the left side of the perinæum. Some operators, also, like the assistant to depress the handle of the staff towards the patient's abdomen, in order to make its convexity project in the perinæum, while others condemn this plan, asserting, that it withdraws the instrument from the bladder. (*Allan, &c* )

Professor Scarpa disapproves of inclining the handle of the staff towards the patient's right groin, (*p.* 15.) and he expressly recommends this instrument to be held firmly against the arch of the pubes, in a line perpendicular to the body of the patient, so that the convex part of the director may be placed towards the rectum, and take the exact course of the axis of the neck of the urethra and prostate gland. (*P.* 20.) This position of the staff is the firmest and most commodious to the surgeon, and Scarpa maintains, that on such stability of the instrument the safety and precision of the lateral operation depend. (*P.* 15.)

The first incision should always commence, below the bulb of the urethra, over the membranous part of this canal, at the place, where the operator means to make his first cut into the groove of the staff, and the cut should extend at least three inches, obliquely downward, to the left of the raphe of the perinæum, at equal distances from the tuberosity of the ischium and the anus. In a large man, the first cut should pass the anus an inch and a half or more; for, it is a general rule in surgery to make free external incisions, by which the surgeon is enabled to conduct the remaining steps of his operation with greater facility, and no where is it so necessary, as where a stone is to be extracted. (*Allan.*) That excellent surgical writer, Callisen, lays it down as a rule to be observed in the lateral operation, *that the incision ought not to affect such parts as can make no impediment to the extraction of the stone; and, therefore,* (says he) *the bulb, and that part of the urethra, which is surrounded by the corpus spongiosum, should never be cut.* Only those parts ought to be divided, which firmly resist the safe introduction of instruments into the bladder, and the extraction of the stone. Hence, the integuments must be opened by an ample incision, and the membranous part of the urethra, transversales perinæi muscles, levator ani, and prostate gland be properly divided. (*Callisen, Systema Chirurgiæ Hodiernæ, Pars 2, p.* 655.) Like Scarpa, however, he is fearful of making a free cut through the neck of the bladder, and, in lieu of doing so, prefers a slow and cautious dilatation of the parts. When the external cut through the integuments has been executed, the next object is to divide the transversales perinæi muscles, which stand, like a bar, across the triangular hollow, out of which alone the stone can be easily extracted. An opening is next to be made into the membranous part of the urethra, a very little way in front of the apex of the prostate gland. Dividing more of the membranous part of the urethra is quite unnecessary, because it will not at all facilitate the passage of the stone outward.

Having placed the beak of the gorget in the groove of the staff, the operator takes hold of the latter instrument himself, raises its handle from the abdomen, so that it may form nearly a right angle with the body, and he stands up. Before attempting to push the gorget onwards into the bladder, he should slide it backwards and forwards, with a wriggling motion, that he may be sure its beak is in the groove of the staff. The bringing forward of the handle of the latter instrument, so as to elevate its point, before introducing the gorget into the bladder, is also of immense importance; for, it is by this means, that the gorget is introduced, along the groove of the staff in the axis of the bladder, the only direction, unattended with risk of wounding the rectum. In fact, the gorget should be introduced nearly in a direction, corresponding to a line drawn from the os coccygis to the umbilicus.

The utmost attention to this last rule is especially necessary, when a staff with a groove not closed at the end is employed. The neglect of it in this case might make the operator cut the bladder with the gorget in several places, as has actually happened. B. Bell mentions the occurrence of such accidents. But, since when the gorget is introduced as nearly as possible in the axis of the bladder, it may transfix and otherwise injure this organ, if introduced either too far, or at all beyond the extremity of the staff, I am decidedly of opinion, that every surgeon, who chooses to perform the lateral operation with a gorget, should employ a staff, the groove of which is closed at the extremity, as is invariably done in France, and is expressly enjoined by Professor Scarpa. (See *Sabatier's Médecine Opératoire, T. 3, p. 223, Edit. 2, and Scarpa's Memoir on Hawkins's Gorget, p. 18, &c.*) There can also be no doubt of the prudence of endeavouring to have only a fixed and limited length of the staff in the bladder. Scarpa specifies an inch and a half as the proper distance, to which the end of the staff should enter the bladder. However, as it is known, that this distinguished Professor is an advocate for a very limited incision, and that consequently, he would not require the staff to extend further than an inch and a half into the bladder, I infer, that operators, who prefer making a freer opening, must use a staff, that reaches into this viscus rather further. Much however will depend upon the breadth and kind of gorget employed.

As soon as the gorget is introduced, the staff is to be withdrawn. Some operators next pass the forceps, along the concave surface of the gorget, into the bladder; while others, with every appearance of being right, recommend the cutting gorget to be withdrawn immediately it has completed the wound; for, then the bladder contracts, and its fundus might be cut, if the gorget were not removed. This should be done in the same direction, in which it entered, pressing it towards the right side, in order to prevent its making a second wound in coming out. If the operator should prefer passing the forceps into the bladder, along the gorget, the latter instrument must be kept quite motionless, lest its sharp edge should do mischief; and, at all events, as soon as the forceps is in the bladder, the cutting gorget is to be withdrawn.

Some operators withdraw the cutting gorget, and introduce a blunt one for the guidance of the forceps; a step certainly unnecessary, as the latter instrument will easily pass, when the incision into the bladder is ample and direct, as it ought always to be.

The operator has next to grasp the stone with the blades of the forceps; for which purpose, he is not to expand the instrument, as soon as it has arrived in the bladder; but, he should first make use of the instrument as a kind of probe, for ascertaining the exact situation of the stone. If this body should be lodged at the lower part of the bladder, just behind its neck, the operator is to open the instrument immediately over the stone, and, after depressing the blades a little, is to shut them, so as to grasp it. Certainly, it is much more scientific to use the forceps at first, merely to ascertain the position of the stone; for, when this is known, he is much more able to grasp the extraneous body in a skilful manner, than if he were to open the blades of the instrument immediately, without knowing where they ought next to be placed, or when shut. No man of experience can doubt, that the injury, which the bladder frequently suffers, from rough, reiterated, awkward movements of the forceps, is not an uncommon cause of such inflammation of this viscus, as too often extends to the peritonæum, and occasions death.

If the surgeon cannot readily get hold of the stone with the forceps, he should introduce his fore and middle fingers into the rectum, and raise the extraneous body up, when it may generally be easily grasped. The stone should be held with moderate firmness, to keep it from slipping from the blades, but, not so forcibly as to incur the risk of its breaking.

Sometimes, the extraction of the stone is attended with difficulty, owing to the operator having chanced to grasp it in a transverse position, in which circumstance, it is better to try to change its direction, or let it go altogether, and take hold of it in another manner. When the stone is so large, that it cannot be extracted from the wound, without violence and laceration, the surgeon may either break the stone by means of a strong pair of forceps, with teeth constructed for the purpose; or he may enlarge the wound with a probe-pointed crooked bistoury, introduced under the guidance of the forefinger of the left hand. The latter plan is generally the best of the two; for, breaking the stone is an exceedingly unpleasant circumstance, as it creates serious danger of calculous fragments remaining behind.

However, as nothing can justify the exertion of force in pulling out a stone, if the operator should be afraid of making the wound more ample, (it being already large and direct) he must break the stone, as above described. As many of the fragments are then to be extracted with the common lithotomy forceps, as can be taken away in this method, after which the surgeon should introduce his finger, in order to feel, whether any pieces of the stone still remain behind. Perhaps, some of these may be most conveniently taken out with the scoop; but, if they are very small, it is best to inject lukewarm water with moderate force into the wound for the purpose of washing them out.

The surgeon, however, cannot be too strongly impressed with the absolute necessity of using the greatest care not to remove the patient from the operating table, while any calculus, or fragment, remains in the bladder. For, the distressing pain of the disorder has been known to recur upon the healing of the wound, and a second operation become necessary. It is a melancholy truth, however, that a fresh calculus may form again in the short space of a few months. I have seen several patients who have been cut for the stone, more than once; and Richerand mentions the case of a surgical instrument-maker, resident at the gate of La Charité, in Paris, who has undergone the operation three times in the course of a year and a half, although after each operation several eminent surgeons carefully examined the bladder, and could not find any calculus remaining in it. (See *Nosographie Chirurgicale, T,* 3, *p.* 549, *Edit.* 4.)

The stone should always be attentively examined immediately it is extracted; because its appearance conveys some information, though not positive, concerning the existence of others. If the stone is smooth on one surface, the smoothness is generally found to arise from the friction of other stones still in the bladder; but, when it is uniformly rough, it is a presumptive sign, that there is no other one remaining behind. In every instance, however, the surgeon should introduce his forefinger, for the purpose of examining; for, it would be an inexcusable neglect to put the patient to bed, with another stone in his bladder.

After the operation of lithotomy, a simple pledget should be laid on the wound, supported by a T bandage; the patient should lie in bed on his back, with his thighs closed; a piece of oil-cloth, and some folded napkins, should be laid under him to receive the urine; and, if the patient be in much pain, a large opiate administered.

An occasional embarrassment to lithotomists is caused by stones in the bladder not being always free and detached: some are embraced very tightly by the coats of this viscus; others are partially engaged in the ureters; they are sometimes fixed in the neck of the bladder; and are not unfrequently found lodged in sacculi accidentally formed in this viscus. These cysts are of different sizes: some are small, and exist in a considerable number; some are deeper, and their orifice is remarked to be smaller, than their base. They appear to be formed by a prolongation of the internal coat of the bladder. Other sacculi are occasionally found, which seem to be composed of all the tunics of the bladder, and they are sometimes of such magnitude, that the bladder appears as if it were divided into two, or more cavities nearly equal in size. Stones, found in these sacculi, sometimes present depressions, in which fungi of the bladder have been received. These vascular prolongations have been observed to insinuate themselves into the considerable inequalities on the surface of these stones. When this happens, a portion of such fungous productions are often extracted with the stone; a circumstance that has deceived some practitioners, and led them to suppose, that the calculi actually adhered to the coat of the bladder. (See *Desault's Parisian Chirurgical Journal, Vol.* 2, *p.* 386—387.)

The extraction of encysted stones, requires different modes of proceeding from those, which have been related. M. Littre conceived, that they might be removed in two ways. When they made only an inconsiderable projection into the bladder, he recommended the introduction of a probe into this viscus, with which instrument the membrane covering the calculus was to be rubbed, a finger being put into the rectum in order to keep it down and facilitate the action of the probe in opening the cyst. When the calculi were very prominent, M. Littre recommended taking hold of them with a pair of forceps, and contusing and breaking the membranous pouch, with the points and asperities upon the inside of the blades of the instrument. He conceived, that suppuration would then destroy the internal parietes of the cyst, and that the stone would fall into the bladder, and admit of being easily extracted. As Sabatier observes, it is plain, that this theory, which is founded on the idea entertained by M. Littre of the manner in which stones become encysted, is totally inadmissible in practice.

Subsequently to M. Littre, the celebrated M. Garengeot ventured to pass a bistoury into the bladder, for the purpose of disengaging a calculus lodged in a particular cyst of the fundus of this organ, behind the pubes. The knife had some tape twisted round the greatest part of its length, and was introduced under the guidance of the left index finger, which was passed in as far as it could reach. The patient was not more than ten, or eleven years old, and consequently of a size, which favoured the operation. The plan succeeded perfectly, inasmuch as the stone was loosened and taken out, and the child recovered. However, as Sabatier remarks, there are many instances, in which this mode of proceeding cannot be imitated: for, if the calculus should be included in a sort of cul-de-sac, as often happens, the entrance of which is narrower than its bottom, and the stone be of considerable size, the incision cannot be made large enough, without risk of cutting through the whole thickness of the bladder, and producing certain death by the effusion of urine in the abdomen.

Other practitioners fancied, that the calculus might be taken hold of with the forceps, and turned about in different directions for the purpose of lacerating its connexions, or even that it might be forcibly extracted, without any serious ill consequences. We learn in Houstet's Dissertation on encysted stones of the bladder, (See *Mém. de l'Acad. de Chir. T.* 2, *p.* 307, *&c. Edit.* 12*mo.*), that the eminent M. Peyronie adopted this method on a patient, thirty-one years of age, whom he cut for the stone in the Hôtel-Dieu. The calculus did not resist long, and its surface is described as being covered with fleshy substances, which composed the adhesions to the bladder. The operation was painful, and it was followed by considerable hemorrhage, tension of the belly, hiccough, cold extremities, and death.

There are some examples, however, in which this bold practice had better success. In 1730, Le Dran extracted from a woman an enormous stone, adherent to that part of the bladder, which lies upon the rectum. The adhesion had been caused by the inequalities of the stone, the irritation of which produced ulceration of the bladder, and fungous growths, which insinuated themselves into the substance of the extraneous body. The excrescences came away with the calculus: the adhesion readily yielded, and its nature was not understood before the stone was examined. Ten days afterwards, some thick membranous sloughs were voided. This calculus is engraved in Le Dran's Treatise on the Operations.

Le Dran states, that he has subsequently extracted similar stones, which were adherent by a less extensive surface; and he relates an operation done by Maréchal, whom he saw in 1715 extract with a pair of forceps, a stone shaped like a calebash, and having its narrow part surrounded by a fungus.

Lastly, Le Dran succeeded in loosening an encysted stone by means of injections, which were introduced through a cannula, that was kept in the bladder nearly six weeks. The position of the calculus led him to suspect, that it was fixed in the extremity of the ureter; he shook it occasionally with a pair of forceps; and, lastly, it fell into the bladder, whence it was extracted without difficulty. It resembled in shape a cucumber, and its large extremity had been lodged in the ureter, from which it could only be gradually removed. Sabatier believes, that a case of this description, which must be very uncommon, is the only one, in which there is any prospect of removing an encysted stone with success. In other examples, he conceives, that it is more prudent to leave the stones, and let the wound heal, than expose the patient to an almost certain death by repeated attempts to extract them. (See *Sabatier's Médecine Opératoire, T.* 3, *p.* 190—194, *Edit.* 2.) Desault employed a sort of concealed knife, called a *coupe-bride*, for opening the cavity, or cyst; and he has recorded one example, in which he thus successfully extracted a stone, stopped at the insertion of the ureter into the bladder, in a woman aged 62. We have seen that Garengeot did the same thing with a bistoury; but, Desault thinks, that this is not altogether a safe instrument, as the stones are round, and the knife may slip, and pierce the bladder. He contends, that the *coupe-bride* has not this objection. No injury can be received from its point, as the blade is concealed, nor can any part be divided, except what the surgeon intends. If the incision should not be completed at first, the blade may be withdrawn, the semicircular notch of the instrument pushed more forward, and the incision prosecuted to any extent. This instrument was invented for the express purpose of dividing membranous bands in the rectum; but, it was afterwards employed with the greatest success in the excision of the tonsils, and in removing fungous tumours situated in cavities. The blade is so contrived, that, when it passes through the semicircular notch, it firmly fixes the parts that are to be divided; which cannot be done with either the scissars, or bistoury, as moveable parts are apt to recede, and render the section difficult. (See *Desault's Parisian Chirurgical Journal, Vol.* 1, *p.* 33, *&c.*)

A stone perfectly encysted would not be expected to produce symptoms equal in severity to those, which arise from an extraneous body actually in the cavity of the bladder. And, yet, in M. Houstet's interesting dissertation, several cases are recorded, which prove, that encysted stones do sometimes cause the same distressing symptoms, which proceed from the presence of a loose calculus in the bladder. Hence, the surgeons, under whom the patients came, were led to introduce the sound, and, in consequence of the sacs, or pouches, in which the stones lay, not being entirely closed, the calculi were distinctly struck by the instrument, and lithotomy undertaken. It deserves particular remark, also, that in a large proportion of these cases, the pouches, or cysts, were not single, but numerous, and occupying different parts of the bladder. In some dissections, referred to by M. Houstet, cysts of this kind were found, not containing any stones whatever; a circumstance, that would rather lead one to suspect, that, in general, the formation of these sacs precedes that of the stones which are sometimes found in them. (See *Observations sur les Pièrres Enkistées et Adhérentes à la Vessie par M. Houstet, in Mém. de l'Acad. de Chir. T.* 2, *p.* 268, *Edit. in* 12*mo.*)

### OF SOME PARTICULAR METHODS AND INSTRUMENTS.

M. Foubert, a very eminent surgeon at Paris, devised and practised a plan of his own, which however, has not been considered by others, as worthy of being imitated. The patient, having retained his urine, so as to distend his bladder, an assistant, with a convenient bolster, presses the abdomen a little below the navel, in such a manner, that by pushing the bladder forwards, he may make that part of it protuberate, which lies between the neck and the ureter. The operator, at the same time, introduces the fore-finger of his left hand up the rectum, and drawing it down towards the right buttock, pushes in a trocar on the left side of the perinæum, near the great tuberosity of the ischium, and about an inch above the anus. Then the trocar is to be carried on parallel to the rectum, exactly between the erector penis and accelerator urinæ muscles, so as to enter the bladder on one side of its neck. As soon as the bladder is wounded, the operator withdraws his fore-finger from the anus.

In the upper part of the cannula of the trocar, there is a groove, the use of which is to allow some urine to escape, immediately the instrument enters the bladder, that the trocar may not be pushed in any further; but, its principal use is for guiding the incision. As soon as the urine began to flow, Foubert, retracting the trocar a little, without drawing it quite out of the cannula, introduced the point of a slender knife into the groove in the cannula; and, by the guidance of this groove, he ran it onwards into the bladder, and was aware of the knife having actually entered this viscus, by the urine flowing still more freely. Then raising the knife from the groove, he made his incision, about an inch and a half in length, through the neck of the bladder, by moving the knife from that point, at which it had entered upwards towards the pubes. And, finally, by moving the handle more largely, than the point of the knife, he opened the outer part of the wound to whatever extent the size of the stone seemed to require, and then, withdrawing the knife, he introduced a blunt gorget to guide the forceps.

An effort was made by Thomas to improve this method; but, he failed; and it was never much adopted. The inability of many bladders to bear being distended, is an insuperable objection; for, without this, the trocar is liable to pass between the bladder and rectum, and even through the bladder into the pelvis. (*Mémoires de l'Acad. de Chir.* 663, *vol.* 1. *Le Dran's Parallèle. Sharp's Critical Inquiry. J. Bell's Principles, vol.* 2.)

In the year 1748, Frère Côme's method of cutting for the stone began to attract considerable notice. The operation was done with a particular instrument, called the *lithotome caché*, by means of which the prostate gland and neck of the bladder were divided, from within outwards. The *lithotome caché* is entitled to much attention, because it is still generally used in several parts of the continent, and sometimes even in this country, especially, by the surgeons of the Westminster Hospital. "In France (says M. Roux) if there is any mode of operating more common, than others, and preferred by the majority of practitioners, it is that in which the instrument, named the *lithotome caché*, is employed." (See *Parallèle de la Chirurgie Angloise, &c. p.* 318.) Frère Côme does not ascribe the invention of this instrument to himself; but, acknowledges, that it resembles the knife for operating upon herniæ, said to have been devised by a French surgeon of the name of Bienaise. It consists of a handle and the blade-part. The latter is slightly curved, about as thick as a quill, furnished with a beak, and excavated so as to form a sheath for a knife of its own length. By means of a kind of lever, the knife can be made to pass out of the sheath, and the distance, to which the blade projects, also admits of being regulated with precision. For this purpose, the handle is divided into six sides, numbered 6, 7, 9, 11, 13 and 15, and which, according as they are more or less elevated, allow the lever to be depressed in different degrees, and the knife to move out of its sheath in the same proportion. Thus, the surgeon can at his option make an incision through the prostate gland and neck of the bladder of six different breadths, the widest being (what the French term) fifteen millimetres.

When the lithotome caché is to be used, the patient must be placed in the same posture, as in every other mode of practising the lateral operation; and after a staff has been introduced, an oblique incision is to be made from the raphe of the perineum, to a point situated rather more towards the anus, than the innermost part of the tuberosity of the ischium. The bulb of the urethra should not be cut, and not too much of the membranous part of the urethra. The fat, and transverse muscles having been divided, and the urethra opened, exactly as in the common operation, the scalpel is to be put down, and the beak of the lithotome introduced into the groove of the staff. Of course, the surgeon, previously to the operation, will have settled the distance, to which the blade of the instrument is to pass out of the sheath, and which must necessarily depend upon the age of the subject, and the presumed size of the calculus. When the beak of the lithotome has been inserted in the groove of the staff, the surgeon is to take hold of the handle of the latter instrument with his left hand, and bring it a little towards himself, at the same time pushing the lithotome into the bladder, with the handle depressed as much as possible. The staff is now to be withdrawn, and the surgeon is to try to feel the stone with the sheath of the other instrument, in order to be able to judge of the size of the calculus, and whether the distance, to which the blade of the knife is intended to move out of the sheath, is such as is likely to make an opening of due, but not unnecessary, magnitude. Things being properly determined, the lithotome is to be held in a position calculated to make a division of the parts, *which is parallel to the cut in the integuments,* and, by means of the lever, the cutting-blade of the instrument, is then to be disengaged from its sheath. The surgeon is next to draw the opened lithotome towards himself, in a perfectly horizontal manner, so as to make the requisite division of the prostate gland and orifice of the bladder.

As Sabatier observes, Frère Côme's method undoubtedly possesses all the advantages of the lateral operation, besides being more easy, than Cheselden's plan, and most of the other modes, subsequently proposed, for cutting the neck of the bladder with perfect smoothness, and to a sufficient extent to allow the calculus to be removed, without any laceration of the parts. (*Médecine Opératoire, T.* 3, *p.* 199.)

There have been several objections urged against the use of the lithotome caché.

1. It is said, that the size of the incision is not always proportioned to the distance, to which the knife moves out of the sheath, and that the instrument, when opened to No. 13 or 15 sometimes makes a smaller incision, than when opened only to No. 5 or 7. This uncertainty is said to depend upon the greater, or less contraction of the bladder in different subjects.

For my own part, I confess, that I am not inclined to put much credit in the accuracy of this last explanation, and suspect the difference sometimes observed must depend upon the operator not taking care to draw out the instrument in an horizontal direction, a thing which is always easy to be done.

2. Frère Côme himself made his incision too high, so that extravasation of urine in the scrotum followed some of his operations; but, the above method of operating is free from any objection of this kind.

3. Some surgical writers have exaggerated the danger of cutting the fundus of the bladder too extensively with the lithotome, and thus producing internal hemorrhage. However, this cannot happen, unless the surgeon raise the handle of the instrument improperly at the mo-

ment of withdrawing it, and as Sabatier himself allows, it is rather the fault of the operator, than of the operation.

4. The arteria pudica profunda and the rectum, which some authors conceive to be endangered, must always be in absolute safety, if the edge of the knife of the lithotome be turned in the direction above recommended.

I think to a surgeon, who understands the right principles of lithotomy, this is one of the best ways of performing the operation.

When I was at Paris in 1815, I saw a French lithotomist, a descendant of Frère Cosme, operate very skilfully with the lithotome caché. A stone of considerable size was extracted from a gentleman, who was, I should think, not less than 70. No apprehensions were entertained of ill success, as I understood this operator hardly ever lost a patient.

M. Roux, when he visited England, seems not to have been informed, that at the Westminster Hospital, the lithotome caché has been commonly employed for many years past. It has also been sometimes used at Guy's Hospital by Mr. A. Cooper. When M. Roux likewise finds fault with the bad construction of this instrument, as made in London, I suspect, he cannot have seen those which are made and sold by Mr. Evans. (See *Voyage fait à Londres, ou Parallèle de la Chirurgie Angloise, &c. p.* 318.)

Le Cat, a surgeon, of Rouen, in Normandy, devised a mode of lithotomy, which would be too absurd to be described, were it less renowned. He thought the neck of the bladder might be dilated, like that of the wound, and his operation was deformed with all the cruelty of the Marian method, and every error attendant on the infant state of the lateral operation. He first introduced a long big staff; he cut forward with a common scalpel, through the skin and fat, till he could distinguish the bulb, the naked urethra, and the prostate gland. Secondly, with another knife, called urethrotome, having a groove on one side, he opened the urethra, just before the prostate, and, fixing the urethrotome in the groove of the staff, and holding it steady, rose from the kneeling posture, in which he performed the outward incision.—Thirdly, holding the urethrotome in the left hand, he passed another knife, the cystotome, along the groove of the urethrotome, and the beak of the cystotome being lodged in the groove of the urethrotome, it was pushed forwards, through the substance of the prostate gland into the bladder. Fourthly, drawing the cystotome a little backwards, he gave the staff to an assistant to be held steadily, and lifting a blunt gorget in the right hand, he placed the beak of it in the groove of the cystotome, and pushed it onwards, till it glided from the groove of the cystotome, along the groove of the staff into the bladder. Then, true to the principles of the apparatus major, and, never forgetting his own peculiar theory, *little incision, and much dilatation*, he forced his fingers along the gorget, dilated the neck of the bladder, and so made way for the forceps. (*J. Bell's Principles, Vol.* 2.)

In 1741, Le Dran described an operation, the introduction of which has been claimed by several since his time. A staff being introduced, and two assistants keeping open the patient's knees, while a third stands on one side of him on a chair, (Le Dran says,) " I then raise up the scrotum, and directing the last assistant to support it with both hands, so as to avoid bruising it, by pressing it either against the staff, or the os pubis, I place his two forefingers on each side of the part, where the incision is to be made; one of the fingers being laid exactly along that branch of the ischium, which rises towards the pubes, and the other pressed upon the raphe, that the skin may be kept fixed and tight. While I thus place the fingers of the assistant, who supports the scrotum, I still keep hold of the handle of the staff, and direct it so as to form a right angle with the patient's body; at the same time, taking care, that the end of it is in the bladder. This position is the more essential, as all the other instruments are to be conducted along the groove of this. If the handle of the staff were kept inclined towards the belly, the end of it would come out of the bladder, and the gorget, missing its guide, would slip between that and the rectum.

" The staff being rightly placed, I take the knife from the assistant, who holds the instruments, and put it into my mouth; then pressing the beak of the staff against the rectum, I feel the curvature of it through the perinæum. The incision ought to terminate, an inch and a half, below where we feel the bottom of the curvature. If we do not carry this incision sufficiently low, it may happen not to be of a size to allow the extraction of a large stone, and might lay us under the necessity of extending it further afterwards, for the skin will not lacerate here, nor easily give way for the passage of the stone. I therefore begin the incision from the lower part of the os pubis, continuing it down to the place, that I before directed for its termination; after which I pass the point of the knife into the groove of the staff, and cutting from below upwards, without taking the point out of the groove, I open the anterior part of the urethra, as far as the incision, that is in the skin.

“The beak of the staff, which was pressed upon the rectum, must now be raised and pressed against the os pubis. At the same time, I turn the handle towards the right groin, that the groove, which is at the beak of the staff, may face the space, between the anus and the tuberculum ischii on the left side. Then carrying the point of the knife down the groove, I slide it along the beak, turning the edge, that it may face the space, between the anus and tuberosity of the ischium. By this incision, I exactly divide the bulb of the urethra, and by doing this on its side, we are sure to avoid wounding the rectum, which, for want of this precaution, has been often cut. This first incision being made, I again pass the point of the knife into the curvature of the staff to the part, where it bears against the perinæum, and direct it to be held there by the assistant, who supports the scrotum. This done, I take a large director, the end of which is made with a beak, like that of a gorget, and conveying this beak, upon the blade of the knife, into the groove of the staff, I draw the knife out. I then slide the beak of this director, along the groove of the staff, into the bladder, and I withdraw the staff by turning the handle towards the patient's belly. The following circumstances will sufficiently satisfy us, that the director is introduced into the bladder; first, if it strikes against the end of the staff, which is closed; secondly, if the urine runs along the groove. I next feel for the stone with this director, and, having found it, endeavour to distinguish its size and surface, in order to make choice of a proper pair of forceps; that is, one of a stronger, or weaker make, or of a large or small size, agreeably to that of the stone; after which I turn the groove, towards the space, between the anus and tuberosity of the ischium, and, resting it there, convey a bistoury along the groove, the blade of which is half an inch broad, and about three quarters of an inch long. I continue the incision, made by the knife in the urethra, and entirely divide the prostate gland laterally, as also the orifice of the bladder; and, I am very certain, that the introducing the use of these two instruments, which are not employed by other lithotomists, does not prolong the operation a quarter of a minute, but, rather shortens the time, both by facilitating the dilatation, that is afterwards to be made with the finger, and by rendering the extraction of the stone more easy. The bistoury being withdrawn, the groove of the director serves to guide the gorget into the bladder. I then introduce my forefinger along the gorget (which is now easily done, as the urethra and prostate, being divided, do not oppose its entrance) and with it I dilate the passage for the stone, in proportion to the size, of which I discover it to be. This dilatation being made, I withdraw my finger, and use the proper forceps” (*Le Dran's Operations, edit.* 5, 1784, *London.*)

The high operation, which we have already described, was introduced by Franco, in 1561, and was again revived in 1658 by Frère Cosme, with what were supposed to be some improvements. The latter proposed to open the bladder in perinæo, and then, through an opening made just above the pubis, he introduced a scalpel with a button-point, with which he slit up, for an inch or two, the linea alba, the knob on the end of the knife pushing aside the peritonæum. After this, he introduced, by the aperture in perinæo, a staff, with which he projected the bladder through the opening, between the recti muscles: this done, he cut into the front of the bladder, and either with his finger and thumb, or with a pair of forceps, he took out the stone. In this way, he extracted a calculus from the bladder, weighing 24 ounces. Were it not for the danger attendant on the double incision into the bladder, and the protraction of the operation by the dissection about the perinæum, this plan might, with propriety, be adopted. Indeed, as modified by Deschamps, who, in place of the puncture in perinæo, perforates the bladder from the rectum, it has met with the approbation of Dr. Thomson, of Edinburgh, who considers this, on particular occasions, to be the most advisable mode of operating. It is evident, however, that if the bladder be thickened and indurated, it will be impossible to raise it above the pubes with the cannula, and, consequently, the plan is only admissible when we have reason to suppose that the stone is too large to be removed from the perinæum, and the bladder is healthy. The puncture from the rectum is simple, attended with no increase of danger, allows the bladder to be elevated by the cannula, and secures a depending outlet for the urine. We thus avoid the necessity of any discharge by the wound above the pubes, we run no risk of the urine insinuating itself into the cellular membrane; no inflammation is excited; no sinuses are formed. (*Burns, in Edinb. Surg. Journal, No.* 13.)

The danger of the beak of the gorget slipping out of the groove of the staff, is one of the chief objections urged against the employment of the first of these instruments. To obviate this, Sir Charles Blicke had the groove of the staff, and the beak of the gorget, so constructed that they locked into each other, and continued fixed till near the extremity of the staff. The contrivance, though plausible and ingenious, is not much used: the point of contact of the beak and body of the instrument is necessarily so small, that it is liable to break. It is allowed, however, that this objection might be removed; but another one is still urged, viz. the beak and groove catching on each other, so as to resist the efforts made to introduce the gorget into the bladder. Every operator knows, that much of the safety of the lateral operation, as performed at present, depends on the ease with which the beak of the gorget slides along the groove of the staff. Le Cat, in 1747, is said to have devised a similar instrument.

Some operators seem to have a good deal of trouble in dissecting into the groove of the staff. Sir James Earle invented an instrument to render this more easy. It consists of a short staff, with an open groove, connected by a hinge, with the handle of another staff, of the usual size, shape, curvature, and length, which may be called the *long staff*. The hinge, by means of a pin, is capable of being disjointed at pleasure. The short staff is sufficiently curved to go over the penis and scrotum, and long enough to reach to that part of the long staff which is just below the beginning of its curvature. The end of the short staff, made somewhat like a pen, with the sides sharpened and finely pointed, is adapted to shut into the groove of the long staff, and its cutting edges are defended from being injured by a proper receptacle which is prepared for it in the groove of the long staff. When the instrument is shut, the groove of the short staff leads into that of the long one, so as to form one connected and continued groove. The short staff is rendered steady by the segment of an arch projecting from the long one through it.

The long staff, separated from the short one, is first introduced in the usual manner, and, the stone having been felt, the short staff is to be put on the other at the hinge. The incision is then to be made in the usual manner, through the skin and cellular membrane, and a second incision through the muscles, so as nearly to lay bare the urethra. The operator then being perfectly convinced, that the extremity of the long staff is sufficiently within the bladder, must bring the end of the short staff down, and press it against the urethra, which it will readily pierce, and pass into the cavity prepared for it in the groove of the long staff. The two pieces being now firmly held together by the operator's left hand, nothing remains to be done, except applying the beak of the gorget, to the groove of the short staff, and pushing it on till it be received in the groove of the long one; and if this latter be made with a contracted groove, it will just enter where the contraction begins, and thus must be safely conducted into the bladder. (*Earle on the Stone; Appendix; Edit. 2,* 1796.) Deschamps describes an instrument, invented by Jarda, a surgeon of Montpelier, which bears a resemblance to Earle's double staff, but was more complicated, being designed to support the scrotum, and also press the rectum out of the way.

With respect to the staff with a contracted groove, I am disposed to believe, that it has been rather too hastily rejected from practice. While gorgets are used, every possible means should be taken to obviate the danger of their slipping from the staff; and any good instrument-maker would have no difficulty in forming a staff with a contracted groove, unattended with any of the objections which have been made to it.

The late Mr. Dease, of Dublin, and Mr. Muir, of Glasgow, considering that the gorget was more apt to slip from the staff in consequence of the latter being curved, and that its beak never slips from the groove of the staff in operating on women, proposed, like Le Dran, to convert the male into the female urethra. They introduce, as usual, a curved grooved staff into the bladder, make the common incision, and open the membranous part of the urethra; but, instead of introducing a gorget on the curved staff, they conduct along the groove a female one into the bladder, and immediately withdraw the other. The gorget is then introduced. This method certainly removes the danger arising from the slipping of the latter instrument.

### LITHOTOMY, AS PERFORMED WITH A KNIFE, INSTEAD OF A CUTTING GORGET, BY SEVERAL OF THE MODERNS.

We have already described, how Frere Jacques and Cheselden used to operate with a knife, without any cutting gorget, in the early state of the lateral operation. The success, which attended the excellent practice of the latter surgeon, certainly far exceeds what attends the present employment of the gorget, for, out of 52 patients, whom he cut successively for the stone, he only lost two; and out of 213, of all ages, constitutions, &c. only 20. These facts are strongly in favour of abandoning the use of the gorget, and doing its office with a knife.

The objections to the gorget are numerous and well founded. In the hands of many skilful operators, its beak has slipped out of the groove of the staff, and the instrument has been driven either between the rectum and the bladder, or into the intestine instead of the latter viscus. Sir

James Earle remarks: "I have more than once known a gorget, though passed in the right direction, pushed on so far, and with such violence, as to go through the opposite side of the bladder." Bromfield, even when operating with a blunt gorget, burst through the bladder and peritonæum, so that the abdominal viscera came out of the wound. (*P.* 270.) I knew of one instance in which the gorget, slipping from the staff, completely severed the urethra from the bladder; the stone was not taken out, and the child died.

We will suppose, however, that the preceding dangers of the gorget are surmounted, as they certainly may be, by particular dexterity, seconded by the confidence of experience. The gorget is introduced, but whatever kind of one has been used, the wound is never sufficiently large for the easy passage of any stone, except one below the ordinary size. Camper has noticed this fact: "Hawkensius solo conductore, cujus margo dexter in aciem assurgit, idem præstat: *omnes plagam dilatant, ut calculum extrahant: dilacerentur igitur semper vesicæ ostium et prostata.*" (*P.* 114.) Dease says: "In all the trials that I have made with the gorget on the dead subject, I have never found the opening into the bladder sufficiently large for the extraction of a stone of a middling size, without a considerable laceration of the parts. I have frequently taken the largest-sized gorget, and could not find, in the adult subject, I ever entirely divided the prostate gland, if it was any way large; and in the operations that were performed here on the living subject, if the stone was large, the extraction was painfully tedious, and effected with great difficulty, and, in some cases, not at all."

I shall dismiss this part of the subject with referring the reader to the spirited and correct remarks on the objections to the gorget in Mr. John Bell's Principles, Vol. 2, Part 2.

The latter author recommends the external incision, in a large man, to commence about an inch behind the scrotum, and to be carried downwards three inches and a half, midway between the anus and tuberosity of the ischium. The fingers of the left hand, which at first kept the skin tense, are now applied to other purposes. The fore-finger now guides the knife, and the operator proceeds to dissect through fat and cellular substance, and muscular and ligamentous fibres, till the wound is free and open, till all sense of stricture is gone; for it is only by feeling opposition and stricture that we recognize the transverse muscle. When this hollow is fairly laid open, the external incision, *which relates merely to the free extraction of the stone, is completed.* If it were the surgeon's design to operate only with the knife, he would now push his fingers deeply into the wound, and, by the help of the fore-finger, dissect from the urethra along the body of the gland, till he distinguished its thickness and solidity, and reached its back part. Then, plunging his knife through the posterior portion of the gland, and settling it in the groove of the staff, he would draw it firmly and steadily towards him, at the same time pressing it into the groove of this instrument, and then the free discharge of the urine, assuring him that the prostate and neck of the bladder were divided, he would lay aside his knife, pass the left fore-finger into the bladder, withdraw the staff, and introduce the forceps. (*John Bell, p.* 197.)

Mr. Charles Bell describes the following method of operating with a knife, instead of a gorget. A staff grooved on the right side, a scalpel with a straight back, and the common lithotomy forceps, are the indispensable instruments. The staff is kept in the centre, and well home into the bladder. The surgeon making his incision under the arch of the pubes, and by the side of the anus, carries it deeper towards the face of the prostate gland: cutting near to the staff, but yet not cutting into it, and avoiding the rectum by pressing it down with the finger. Now carrying the knife along the staff, the prostate gland is felt. The point of the knife is run somewhat obliquely into the urethra, and into the lateral groove of the staff, just before the prostate gland. It is run on, until the urine flows. The fore-finger follows the knife, and it is slipped along the back of it, until it is in the bladder. Having carried the fore-finger into the bladder, it is kept there, and the knife is withdrawn. Then the forceps, directed by the finger, are introduced. (*C. Bell's Operative Surgery, Vol.* 1, *p.* 361.)

Mr. Allan Burns, of Glasgow, recommends the following plan: "The plan, says he, introduced by Cheselden, and revived by Mr. J. Bell, I would assume, as the basis of the operation; but still, along with their mode, I would blend that of Mr. Dease, by which, I imagine, we may overcome some of the disadvantages attendant on each considered individually.

"For more than twelve months, I have been in the habit of shewing such an operation, which is as simple in its performance, as the one in general use, is attended with less danger to the patient, permits of an incision varying in size, according to the wish of the operator, and completely prevents injury of the rectum, or pudic artery. To perform this operation, I introduce into the urethra a common curved staff, then make the usual incision into the perinæum, divide fully and freely the levator ani, so as to expose the whole extent of the membranous part of the urethra, the complete extent of the prostate gland, and a portion of the side of the neck of the bladder. When this part of the operation is finished, I open the membranous part of the urethra, and introduce through the slit a straight or female staff, with which I feel the stone, and then withdraw the curved staff. This done, I grasp the handle of the staff firmly in my left hand, and with the right lay hold of the knife. Having ascertained, that the two instruments are in fair contact, I rest the one hand upon the other, pressing them together, and then by a steady extraction, I pull out the knife and staff together, which is preferable to drawing the knife along the staff; it prevents the risk of the one slipping from the other; it guards the bulb of the urethra, and every other part from injury; for, between them and the cutting instrument, the staff is interposed;" &c. "When introducing the knife, the side of the blade must be laid flat along the fore-finger of the right hand, which is to project a little beyond the point. In this state the finger and knife are to enter the wound, opposite the tuber-ischii; but, in proportion as they pass along, they are to be inclined forward, till at last, with the point of the finger, the staff is to be felt through the coats of the bladder, a little beyond the prostate, and rather higher than the orifice of the urethra. Here the knife is to be pushed, with the finger, through the bladder, and when the point is fairly fixed in the groove of the staff, the operation is to be finished by the steady extraction of both instruments." (*Allan Burns, in Edinburgh Surgical Journal, No.* 13.)

The knife of Cheselden does not require so much violence to divide the parts as the gorget does; cannot slip in some instances before, in others behind the bladder; and it will make a wound sufficiently ample for the easy extraction of the stone, without the least laceration. The possibility of its wounding the rectum, Dr. Thomson thinks might be obviated by employing it as follows: "After having made the external incisions, and divided the membranous part of the urethra, in the way that it is usually done for the introduction of the beak of the gorget, a straight-grooved staff is to be introduced into the groove of the curved staff, and pushed along it into the bladder. The curved staff is then to be withdrawn, and the surgeon, laying hold of the handle of the straight staff with his left hand, and turning the groove upwards and a little outwards, presses the back of it downwards towards the right tuber ischii, and holds it steadily in that position. The point of a straight-backed scalpel being now introduced into the groove of the staff, with its cutting edge inclined upwards and a little outwards, is to be pushed gently forwards into the bladder. The size of the scalpel need only be such as will make a wound in the prostate gland and neck of the bladder, sufficiently large to admit the fore-finger of the left hand. The scalpel being removed, this finger is to be introduced into the bladder, through the wound which has been made, and the staff may then be withdrawn. With the finger the surgeon endeavours to ascertain the size and situation of the stone. If, after this examination, he judges the incision in the neck of the bladder to be too small for the easy extraction of the stone, he next introduces into the bladder a straight probe-pointed bistoury, with its side close to the fore part of his finger, and its cutting edge upwards. By turning this edge towards the left side, and by keeping the point of his finger always beyond the point of the bistoury, he may safely divide, in the direction of the first incision as much of the prostate gland, and neck of the bladder, as he shall deem necessary." See *Observations on Lithotomy, &c. with a Proposal for a new Manner of Cutting for the Stone, by J. Thomson, M.D. one of the Surgeons of the Royal Infirmary, &c. Edinb.* 1808. In this small work, the reader will find additional particulars.

Mr. Allan, who is a strenuous advocate for using the knife instead of the gorget, directs us, after laying bare the urethra, and bringing the staff so as to form a right angle with the patient's body, to feel that the instrument is fairly lodged in the bladder. The operator is to use the fore-finger of his left hand as a director in feeling for the groove in the staff, and in distinguishing the prostate gland; and, with this finger, he is to depress the rectum, and direct the deeper part of his dissection. "Feeling the gland, with the point of the fore-finger of the left hand, and the groove of the staff in the upper part of the wound, the assistant is desired to steady his hand, and the operator, holding his knife as he does a writing pen, his fingers an inch and a half from the point, turns up its edge towards the staff, and strikes its point through the membranous part of the urethra into its groove, half an inch before the prostate gland. He now turns the back of the knife to the staff, slides it a little backwards and forwards in the groove, that he may be sure he has fairly entered; then shifts the fore-finger, with which he guides the incision, places it under the knife, and carries always before the point of it, to prevent the rectum being wounded; he then lateralizes the knife, enters the substance of the prostate, is conscious of running the scalpel through its solid and fleshy substance, and judges, by the finger, of the extent of the incision which he now makes. The urine flow out; he slips his finger into the opening, withdraws the scalpel, and gives it to an assistant, who hands him the forceps, which he passes into the bladder, using the fore-finger of his left hand, which is still within the wound, as a conductor. The forceps instantly encounter the staff, which serves to conduct them safely into the bladder, while the finger guides them through the wound; &c. (*Allan on Lithotomy, p.* 48, *Edinb.* 1808.)

I leave the reader to judge, which of the foregoing modes of operating with a common knife, claims the preference. Perhaps Cheselden's manner, which is also Mr. John Bell's, is as deserving of recommendation as any.

That the performance of lithotomy with a knife, when the operator has the assistance of a proper staff, cannot be difficult, may be inferred from there being no particular difficulty in the method, even when no staff at all is employed. In the spring of the year 1814, when at Oudenbosch in Holland, I was requested by Serjeant Ryan, of the 1st Foreign Veteran Battalion, to see his little boy, about four years old, who was troubled with symptoms, which made me immediately suspect, that there was a stone in the bladder. As I had no sound, I introduced into this viscus a small silver catheter, which distinctly struck against a calculus. Without taking the instrument out again, I determined to perform lithotomy with a common scalpel. Indeed, no other mode could be adopted, as we had neither staff, gorget, nor lithotomy instruments of any kind. After making the external part of the incision in the common way, I found, that the catheter afforded me no guidance. I therefore withdrew it, and dissected deeply by the side of the prostate gland, till the fore-finger of my left hand passed rather beyond it. The scalpel was then plunged into the bladder, behind this gland, under the guidance of my left fore-finger, and with the edge turned towards the urethra. The necessary division of the prostate and neck of the bladder was then made by cutting inwards and upwards in the direction of the rest of the wound. With a small pair of ordinary dressing forceps, a calculus, rather larger than the end of the thumb, was easily extracted. This operation was done at the Military Hospital, in the presence of Dr. Shanks, of the 56th regiment, and several other medical officers. Not a single bad symptom ensued, although the army unexpectedly moved into the field three days afterwards, and the child travelled about for some time in a baggage cart, in an exposed and neglected state. The wound was consequently rather longer in healing than usual; but, this was the only ill effect. The little boy in the end completely recovered.

Of late years, many surgeons have chosen to perform lithotomy with several kinds of beaked scalpels. The practice, indeed, is still gaining ground. Mr. Thomas Blizard's knife is one of the best. Its blade is long, straight, and narrow, and, like the gorget, is furnished with a beak, by means of which it admits of being conducted along the groove of the staff into the bladder, after the external incisions have been made. The staff is then withdrawn, and the operator has now the power of making the incision through the prostate and neck of the bladder downwards and outwards to any extent, which the parts will allow, or the case require. This is one of the principal advantages, which beaked long narrow knives have over gorgets, which, after their introduction, cannot be further used for the enlargement of the wound. The narrow knife will also cut more safely downwards and outwards, than any gorget; nor is it subject to the serious danger of slipping away from the staff, and going we know not where; because the moment its beak and extremities have entered the bladder, the staff is no longer necessary, as the necessary extent of the blade will then readily pass in without the aid of any conductor at all. I need hardly observe, also, that in this method, we have nothing like the awful, perilous, and violent thrust of the gorget, which, in the event of a little unsteadiness in the operator's hand, or of any fault either in the position of the staff, or the direction of the gorget, will do irremediable and fatal mischief.

### A FEW GENERAL REMARKS ON THE BEST MODE OF MAKING THE INCISION IN THE LATERAL OPERATION: AND SOME CRITICAL REFLECTIONS ON THE PRINCIPLES INCULCATED BY PROFESSOR SCARPA.

*Perhaps, of all the great operations in surgery, lithotomy is that, in which great awkwardness, mortifying failures, and dangerous blunders, are most frequently observed. Many a surgeon, who contrives to cut off limbs, extirpate large tumours, and even tie aneurismal arteries, with *éclat*, cannot get through the business of taking a stone out of the bladder in a decent, much less, a masterly style. This fact is so familiarly known in the profession, and its truth so often exemplified, that I may well be excused the unpleasant task of relating in proof of it all the disasters, which have come to my own personal knowledge. But, I must take the liberty of remarking, that, in this branch of surgery, a great number of individuals do not profit by these instructive lessons of experience. The more they see of lithotomy, the more they are convinced of its dangers; yet, too often, instead of studying the causes of ill success, they merely derive from the examples before them, a suspicion of the unskilfulness of the operator, or some discouraging conjectures about the difficulties of the operation.

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* I had the honor of communicating these observations last spring to the Medical and Chirurgical Society of London.

The establishment of certain principles to be observed in lithotomy, appears the most probable way of diminishing the frequency of the accidents and failures of this common operation. If these principles are not violated, the kind of instrument employed is but a secondary consideration, and the surgeon may do nearly the same thing with an ordinary dissecting knife, a concealed bistoury, a beaked scalpel, or a well made gorget.

After the very opposite principles, and different methods of cutting for the stone, which are explained in the preceding columns, as preferred by different surgeons, I think it may be useful to offer a few general observations on the proper direction and size of the incision. These points, which are of the highest practical consequence, in regulating the principles, which ought to be observed in lithotomy, are far from being settled, as must be plain to every body who recollects that Desault and Mr. John Bell recommend a free opening; Scarpa and Callisen a small one; that Mr. Abernethy and Scarpa employ gorgets, which cut upwards and outwards, at angles of 45° and 69° from the axis of the urethra; and that the gorgets of Cruickshank, B. Bell, Desault, Mr. Cline, and most other surgeons are constructed for cutting either directly outwards, or outwards and downwards.

The judgment which I have formed from all that I have seen and read of lithotomy, makes me desirous of impressing upon the recollection of surgeons the several advantages of making the incision, through the whole of the parts cut in lithotomy, in a straight, regular, direct manner, from the surface of the skin in the perineum to the termination of the wound in the urethra and bladder. In an adult subject, the external wound should commence about an inch above the anus. The impropriety of beginning it higher up, has been duly insisted upon by Sharp, Bertrandi, Callisen, and every good writer on the operation. "Il ne faut couper l'urétre que le moins, qu'on peut, parcequ'on obtient par ce moyen une meilleure voie pour pénétrer dans la vessie sous l'angle du pubis. C'est avec raison que Sharp dit que l'incision de l'urétre faite au dessus de cet angle est si peu utile pour l'extraction de la pierre, qu'on n'en retireroit pas plus d'avantage en le coupant presque dans toute sa longueur." (*Bertrandi, Traité des Opérations, p.* 127.) And Callisen lays it down as a maxim: "Ut eæ partes haud sectione attingantur, quæ pro calculi egressu nihil faciunt; adeoque bulbus urethræ, et hujus pars corpore spongioso circumdata intacta relinquatur." (*Systema Chirurgiæ Hodiernæ; Pars Posterior; p.* 655.)

Extraordinary, however, as it may seem, cutting too much of the urethra is one of the most common faults still committed by modern surgeons. The incision in the integuments is to be large, at least, between three and four inches in length; because a free opening in the skin is not only exempt from danger, but attended with many advantages, especially, those of facilitating the other steps of the operation, and preventing afterwards any lodgment and effusion of urine. The external wound ought to be directed towards a point, situated a very little towards the anus, from the innermost part of the tuberosity of the ischium. From the line, thus made, the incision should be carried inward and upward, through all the parts between it and the side of the prostate gland. Another line, extending from the inferior angle of the wound to the termination of the cut in the bladder, forms the precise limits, to which the depth of the incisions should reach, and no further.

The great principle of making the axis of the wound as straight and direct as possible, should always be kept in view, whether the surgeon employ a common scalpel, which cuts into the bladder, from without inwards, or other instruments, which divide the prostate gland, and neck of the bladder, from within outwards, like the bistoire caché, beaked knives, and every kind of cutting gorget. In the latter circumstance, the only difference consists in cutting, from the bladder and urethra, downwards and outwards *towards a point, situated a little way more inwardly than the tuberosity of the ischium*, instead of carrying the incision from this point, upwards and inwards, through the side of the prostate gland and the orifice of the bladder. The following may be enumerated as important advantages of attending to the foregoing principle:

1. The wound is made in that direction, which affords the greatest room for the extraction of large stones; and the axis of the incision being also as nearly straight as possible, the introduction of forceps, and the passage of the calculus outward, are materially facilitated.

That these are important advantages, I think every surgeon will allow, who knows how much of the pain and danger of lithotomy depends upon the injury, which the parts suffer from the exertion of violence in extracting the stone, and the repeated introduction of the forceps. Cheselden, the most successful lithotomist England ever produced, made the incision in the direction here recommended, sometimes inward and upward; sometimes outward and down-

ward. The following remarks of another excellent surgeon merit particular attention: "J'ai vu plusieurs fois dans les Hôpitaux de Paris, que les Chirurgiens, coupant trop en haut vers l'angle du pubis, sentoient une grande résistance au périné, quand ils vouloient retirer le calcul avec les tenettes; on voyoit le périné se tuméfier par la pression, qu'y faisoit la pierre; en ce cas, quelques operateurs plus sages abandonnoient la pierre, introduisoient de nouveau le gorgeret, et en tournant en dessous la cannelure de celui-ci, prolongeoient l'incision obliquement vers la tuberosité de l'os ischion; et enfin à la faveur de cette plus grande ouverture, retiroient la pierre sans causer de déchiremens." (*Bertrandi, Traité des Opérations, p.* 133.) Larger stones may likewise be thus extracted, without being broken, than in any other mode of making the lateral incision, as must be obvious to every practitioner, who recollects the very limited room, afforded at the upper part of the triangular space, between the arch of the pubes, the ramus of the ischium, and the neck of the bladder. This consideration cannot fail to have great weight with all surgeons, who feel duly convinced, how unsatisfactory a method it is to break a calculus, in order to get it out of the bladder. The measures necessary for the removal of all the fragments protract the completion of the operation, and seriously increase its danger; while the continuance of a single part of the stone behind may cause a renewal of all the grievances, for the cure of which the patient submitted to the operation.

2. The arteria pudica profunda can never be injured, because the surgeon does not let the knife or gorget approach nearer to the ischium, than a point which is situated a little way from the tuberosity of that bone towards the anus; and consequently the edge of the instrument cannot come into contact with the inside of the tuberosity and ramus of the ischium, where the great pudic artery is situated.

3. The rectum will not be wounded, because the direction of the axis of the incision, either downwards and outwards to the above-mentioned point, or from that point inwards and upwards, sufficiently removes the edge of the knife, or gorget, from the intestine. But, the rectum will be in still greater safety, if it be pressed downward with the fore-finger of the left hand in the wound, and the prudent custom of emptying it, by means of a clyster, a short time before the operation, be not omitted; for, no lithotomist should ever forget, that, when this bowel is considerably distended with feces, it rises up a little way on each side of the prostate gland.

4. As the seminal duct penetrates the lower part of the substance of the prostate gland, in order to reach the urethra, and the knife, or other instrument employed, divides the upper portion of the side of that gland inward and upward, or outward and downward, it is obvious, that the duct will not be in the least danger of being cut.

The judicious Callisen is well aware of the advantages of making a smooth, even, direct incision into the bladder*; but, like Professor Scarpa, he is averse to making a free cut through the neck of that viscus. Indeed, as we shall presently notice, Scarpa does not sanction cutting any portion of the bladder whatsoever.

Every practitioner, who will take the trouble to look over the history of the lateral operation, will find, that such lithotomists as have particularly distinguished themselves by their unparalleled success, as Frère Jacques, Cheselden, Côsme, &c. all made a free incision into the bladder. This fact alone is enough to raise doubts of the goodness of the advice delivered upon this subject by Callisen and Scarpa; especially, as neither they, nor any other modern surgeon, can boast of having cut patients for the stone with a degree of success, at all equal to that of the above-mentioned operators. The extraordinary success, which characterized Cheselden's practice, we have already detailed. (See *p.* 697.) The accounts, which we have, of the successful operations done by Frère Jacques and Côsme, are equally remarkable. During my residence at Paris, last spring, I saw a celebrated lithotomist of that city, an actual descendant of Frère Côsme, extract a stone of considerable size, on the plan of his well known ancestor. The incision was ample and direct, so that the calculus was taken out with perfect ease. Now as the operations of this professed lithotomist are very numerous, and he enjoys the reputation of scarcely ever losing a patient, are we not justified in inferring, that the advocates for a small opening are promulgating the worst advice, which can be offered to the practitioner? My own observations certainly tend to such a conclusion, as will be presently explained.

The tract recently published by Scarpa, (*Memoir on the Cutting Gorget of Hawkins, &c. trans. by Briggs*) has for its main objects the recommendation of a modification of Hawkins's gorget, and the inculcation of the propriety of making a small limited incision in the prostate gland, without cutting any part of the bladder. As sufficient room cannot thus be obtained for the extraction of even a stone of moderate size, he is an advocate for the gradual dilatation of the urethra and orifice of the bladder. He maintains, that the lateral operation, though executed with the greatest precision, does not exempt the surgeon from dilating in a certain degree the orifice of the bladder, and cervix of the urethra, the dilatation of those parts, however moderate, being always necessary even where the calculus is of middling size. He states, that, in the adult, the orifice of the bladder dilates almost spontaneously to the diameter of five lines; and he adds, that the lateral incision, within proper limits, divides the body and base of the prostate gland to the depth of four, or, at most, five lines, forming with the five, to which the orifice of the bladder naturally yields, an aperture of ten lines. But, observes Scarpa, in an adult, a stone of ordinary size and oval figure, is sixteen lines in the small diameter, to which must be added the thickness of the blades of the forceps: consequently, even after the incision has been made with the most scrupulous exactness, the stone, though of moderate size, cannot pass out of the bladder, unless the dilatation of the base of the gland and orifice of the bladder, be carried to the extent of nearly eight lines, beyond the size of the aperture made with the knife. But, says Scarpa, if, in order to avoid distending the parts to the extent of eight lines, the base of the prostate gland, together with the orifice of the bladder, and a part of its fundus, be divided to a depth equivalent to it, *the event would necessarily be an effusion of urine into the cellular membrane, between the rectum and bladder, and consequently suppuration, gangrene, fistulæ, and other serious evils.* (*Page* 4—5.)

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* Vulnus sit æquale, haud angulatum, conicæ figuræ, apice vesicam respiciente, externa plaga ampla, et quatuor pollicum longitudine, unde effluxus sanguinis, puris, lotii, arenæ, facilitatur. See Systema Chirurgiæ Hodiernæ; Pars Posterior, p. 656, Hafniæ, 1800.

According to Scarpa, the apex of the prostate gland forms the greatest resistance to the introduction of the forceps and the extraction of the stone, and, therefore, ought to be completely divided; (*p.* 7.) but, he contends, that two, and sometimes three, lines of the substance of the base of the gland, should be left undivided; which, he asserts, is a matter of great importance, because the untouched portion, around the orifice of the bladder, prevents the effusion of urine, and the formation of gangrene, or fistulæ, between that part and the rectum. (*P.* 22.)

After this statement of one of the great principles, which Scarpa wishes to be observed in the performance of the lateral operation, a question, or two, naturally arise. Are we then to conclude, that the plan of making a free and direct incision into the bladder ought to be abandoned? Must we forget, that it was this method, which answered so well in the hands of Cheselden and the several renowned lithotomists already enumerated? And must we believe that the advice, delivered upon this point by Bertrandi, Desault, Mr. John Bell, and all the best modern surgeons in this country, is founded only upon a capricious partiality to the free use of cutting instruments?

Earnestly as I respect the names of a Callisen, and a Scarpa, their authority cannot influence me further, than I find it coincide with the dictates of experience,—the great arbitrator of every disputed point in practice.

We have seen, that an apprehension of effusion of urine, gangrene, fistulæ, &c. is the only reason, assigned by Scarpa for his aversion to making a complete division of the side of the prostate gland, and orifice of the bladder. But, I would enquire, do we find extravasation of the urine, between the rectum and bladder, and gangrene and fistulæ, so frequent after lithotomy in England, as to render it probable, that these ill consequences can ever proceed from our usual mode of dividing completely, not only the side of the prostate gland, but also the adjoining part of the bladder? Are such bad effects so often experienced in this country, as to constitute a material source of uneasiness in the mind of a surgeon about to undertake lithotomy? Do they form a substantial reason for abandoning the maxim of always endeavouring, as far as circumstances will allow, to make an incision of sufficient size for the easy removal of the calculus? And, would not Scarpa's method of stretching and dilating the wound, in order to get the stone out of the bladder, often dangerously prolong the operation; lead to much mischief from the repeated use of the forceps; cause serious contusion and lacerations of the parts; and, for all these reasons, render inflammation of the bladder and peritoneum, very likely to follow?

In the course of the nineteen years, that I have been in the profession of surgery, I have seen the lateral operation performed more than fifty times, either with various kinds of gorgets, beaked knives, the lithotome caché, or common scalpels. In all these examples, the avowed intention of the surgeon was to make a free opening into the bladder. I do not mean, however, to say, that this was always actually accomplished, since the bad construction of the instruments employed, and other causes, sometimes frustrated the wise design of the operator. But, what was the consequence? Generally speaking, those surgeons who made only a small incision into the bladder, and kept their patients a long while upon the operating table, ere they succeeded in getting out the stone, by the repeated and forcible use of the forceps, had the mortification to see very few of their patients recover; a large proportion of them being carried off by peritonitis, on the third, or fourth day, after the operation.

On the contrary, when the incision was ample and direct, so that the calculus could be easily and gently removed, the patients were almost always saved.

During the first six, or seven years of the long time, during which I have enjoyed frequent opportunities of seeing lithotomy performed in St. Bartholomew's hospital, gorgets were invariably used, most of which instruments made an insufficient opening. The consequence was that many of the patients were detained a long while upon the operating table, before the stone could be extracted, and some considerable numbers were lost by peritonitis. Of late years, however, in the same institution, common scalpels and beaked knives have been often used; a freer opening has been generally made; and the proportion of deaths from peritonitis is strikingly lessened. These facts strongly impress my mind with the truth of all that I have urged respecting the advantages of making the opening large, and in the best direction for the easy passage of the stone outward.

With respect to the degree of importance, which ought to be attached to the fear of effusion of urine, between the bladder and rectum, gangrene, fistulæ, &c., I can only say, that they are inconveniences which are not commonly observed after lithotomy in this country. In two, or three instances only, I have known the urine come through the wound longer, than usual, and these cases ended well. As for the extravasation of urine and sloughing, I shall merely remark, that, although there cannot be a doubt of their occasional occurrence, they have not taken place after any of the numerous operations, with the results of which I have been acquainted.

All these facts and considerations, therefore, incline me to doubt whether the apprehension of the effusion of urine, fistulæ, &c. be sufficiently serious and well founded to make it advisable for surgeons to relinquish the plan of making a complete division of the side of the prostate gland, and neck of the bladder, in the operation of lithotomy. Nor is it at all clear to my mind, that effusion of urine and sloughing are likely to be the effect of practising a free opening. Indeed, whenever they do happen, I believe they proceed from a totally different cause, viz. from the incision in the skin being too small and too high up, and from the axis of the internal part of the incision not corresponding with that of the external wound. Hence, the urine does not readily find its way outward, and some of it passes into the neighbouring cellular membrane.

In confirmation of the foregoing remarks, I beg leave to cite the sentiments of one of the greatest and most experienced of modern surgeons. Speaking of the defects of Hawkins's gorget, Desault observes: "La méthode de l'enfoncer horizontalement dans la vessie sur le cathéter tenu à angle droit avec le corps, a deux grands désavantages: d'un côté celui de pénétrer par l'endroit le plus rétréci du pubis, et par conséquent de ne faire que difficilement une ouverture suffisante; d'un autre côté, celui de ne pas établir de parallélisme entre l'incision extérieure des tégumens qui est oblique et celle du col de la vessie et de la prostate, qui se trouvé alors horizontale. De-là la possibilité des infiltrations par les obstacles qui les urines trouveront à s'écouler."

No doubt also some of the worst, and most dangerous, urinary extravasations after lithotomy, have proceeded from another cause, pointed out by the same excellent surgeon. "Imprudemment porté dans la vessie, le gorgeret peut aller, par le stylet beaucoup trop long qui le termine, heurter, déchirer, perforer même la membrane de la vessie, et donner lieu à des infiltrations d'autant plus dangereuses, que le lieu d'ou elles partent est plus inaccessible. Cet accident est surtout à craindre, lorsque, comme les Anglais, on se sert de cathéter sans cul-de-sac." (See *Œuvres Chirurgicales, de Desault par Bichat, Tom. 2, p.* 460—461.)

### LITHOTOMY IN WOMEN.

Women suffer much less from the stone than men, and far less frequently stand in need of the operation of lithotomy. It is not, however, that their urine will not so readily produce the concretions, which are termed urinary calculi. The reason is altogether owing to the shortness, largeness, and very dilatable nature of the female urethra; circumstances, which in general render the expulsion of the stone with the urine almost a matter of certainty. The records of surgery present us with numerous instances, where calculi of vast size have been spontaneously voided through the meatus urinarius, either suddenly without pain, or after more or less time and suffering. Heister mentions several well authenticated examples of this kind. Middleton has also related a case, where a stone, weighing four ounces, was expelled in a fit of coughing, after lodging in the passage a week. Collet speaks of another instance, where a stone about as large as a goose's egg, after lying in the meatus urinarius seven or eight days, and causing a retention of urine, was voided in a paroxysm of pain. A remarkable case is related by Dr. Molineux in the early part of the Philosophical Transactions: a woman voided a stone, "the circumference of which measured the longest way seven inches and six-tenths, and round about, where it was thickest five inches and three-quarters; its weight near two ounces and a half troy.

Sometimes, after the passage of large calculi, the patient has been afflicted with an incontinence of urine; but, in general, this grievance lasts only a short time.

The naturally large size and dilatable nature of the female urethra, have suggested the plan of endeavouring to expand this passage by various means, so that a stone in the bladder may be taken out with a pair of forceps, without having occasion to employ any cutting instrument whatsoever. This method was proposed by Douglas nearly a century ago, who not only recommended the use of sponge for the purpose, but also dried gentian root, as being more gradual in its expansion, and better adapted to the object.

Mr. Bromfield has published the case of a young girl, in whom he effected the necessary dilatation by introducing into the meatus urinarius, the appendicula cœci of a small animal in a collapsed state, and then filling it with water by means of a syringe. The piece of gut, thus distended, was drawn out, in proportion as the cervix vesicæ opened, and, in a few hours, the dilatation was so far accomplished, that the calculus had room to pass out. (See *Chirurgical Obs. and Cases, Vol.* 2. *p.* 276.)

Mr. Thomas very recently met with a case, in which, after dilating the meatus urinarius with sponge tent, he succeeded in extracting an earpicker which lay across the neck of the bladder. The passage was so much enlarged, that the left fore-finger was most easily introduced, and (says this gentleman) "I believe had the case required it, both thumb and finger would have passed into the bladder, without the smallest difficulty." After adverting to this, and other facts, proving the ease, with which the female urethra can be dilated, Mr. Thomas remarks: "If these relations can be credited, and there is no reason why they should not, I can hardily conceive any case, in a young and healthy female subject, and where the bladder is free from disease, where a very large stone may not be extracted, without the use of any other instrument, than the forceps, the urethra having first been sufficiently dilated by means of the sponge tents. For this purpose, the blades of the forceps need not be so thick and strong, as those commonly employed. (See *Medico Chirurgical Transactions, Vol.* 1, *p.* 123—129.)

Some surgeons have extracted stones from the female bladder in the following manner: the patient having been placed in the position commonly adopted in the lateral operation, a straight staff, with a blunt end, is introduced into the bladder, through the meatus urinarius. The surgeon then passes along the groove of the instrument the beak of a blunt gorget, which instrument becoming wider towards the handle, effects a part of the necessary dilatation. The staff being withdrawn, and the handle of the gorget taken hold of with the left hand, the right fore-finger with the nail turned downwards, is now introduced slowly along the concavity of the instrument. When the urethra and neck of the bladder have thus been sufficiently dilated, the finger is withdrawn, and a small pair of forceps passed into the bladder. The gorget is now removed, and the stone taken hold of, and extracted. (See *Sabatier's Médecine Opératoire, tom.* 2, *p.* 103.)

Notwithstanding these favourable accounts of the practice of dilating the female urethra, for the purpose of removing calculi from the bladder, the generality of surgeons prefer the plan of making an incision. It is certain, that some patients have found the method insufferably tedious and painful. But the strongest objection to the practice has arisen from the incontinence of urine, which occasionally follows any great distention of the urethra and neck of the bladder. Mr. Thomas believes, however, that this unpleasant symptom is quite as often a consequence of the operation of lithotomy, as now usually performed. (*Medico Chirurgical Transactions, Vol.* 1, *p.* 127.)

Lithotomy on females is much more easy of execution, and less dangerous than the same operation on the male subject. It may be done in various ways; but, the surgeons of the present time constantly follow the mode of making the requisite opening by dividing the urethra and neck of the bladder. A straight staff, or director, is introduced through the meatus urinarius; the groove is turned obliquely downwards and outwards, in a direction parallel to the ramus of the left os pubis; and a gorget, or knife, is thus conducted into the bladder, and makes the necessary incision. Some operators prefer the lithotome caché, which, after being introduced, is opened as far as is deemed proper, and then drawn out with its edge turned obliquely outwards and downwards.

The French surgeons Louis and Flurant, were the inventors of particular bistouries for dividing both sides of the female urethra at once. The instrument of the former effected this purpose, in passing from without inwards; that of the latter, in passing from within outwards. Flurant's bistoury bears some resemblance in principle to Frère Côme's lithotome caché, or to the cutting forceps, with which Franco used to divide the neck of the bladder. The reason, assigned in recommendation of these bistouries, is, that they serve to make a freer opening for the passage of large stones, than can be safely made by cutting only in one direction. At present, however, they are never used. Were the stone known to be very large, Sabatier seems to prefer the apparatus altus.

A case may present itself, in which the posterior part of the bladder drawn downwards by the weight of the stone, may displace a portion of the vagina, and make it protrude at the vulva in the form of a swelling. Here, there would be no doubt of the propriety of cutting into the tumour, and taking out the foreign body contained in it. Rousset performed such an operation, and Fabricius Hildanus in a case, where the stone had partly made its way into the vagina, enlarged the opening, and successfully extracted the foreign body.

M. Mery once made the proposal of cutting into the posterior part of the bladder, through the vagina, after introducing a common curved staff; but the apprehension of urinary fistulæ made him abandon the project.

The existence of extraordinary circumstances may always render a deviation from the common modes of operating not only justifiable, but absolutely necessary. Thus, Tolet met with a case, where a woman had a prolapsus of the uterus, with which the bladder was also displaced. In the latter viscus, several calculi were felt. An incision was made into it, and the stones extracted, after which operation, the displaced parts were reduced, and a speedy cure followed. (*Sabatier's Médecine Opératoire, tom.* 2, *p.* 107.)

The incontinence of urine, consequent to lithotomy in women, is by no means an unfrequent occurrence. Mr. Hey cut two female patients for the stone, both of whom were afterwards unable to retain their urine, and were not quite well when discharged from the Leeds Infirmary. These cases led Mr. Hey in a third example to endeavour to prevent the evil, by introducing into the vagina a cylindrical linen tent, two inches long, and one broad, with a view of bringing the edges of the incision together, without obstructing the passage of urine through the urethra. The plan answered, if it be allowable to make such an inference from a single trial. (See *Hey's Practical Observations in Surgery, p.* 560, *Edit.* 1810.)

### TREATMENT AFTER THE OPERATION.

If the internal pudendal artery should be wounded, and bleed profusely, the best plan is to introduce into the wound a piece of firm sponge, with a large cannula passed through its centre. The expanding property of the sponge, on its becoming wet, will make the necessary degree of compression of the vessel, which lies too deeply to be tied. When there is much coagulated blood lodged in the bladder, it is customary to wash it out by injecting lukewarm water.

I cannot say, that it has fallen to my lot to see any cases (out of the great number which I have seen in Bartholomew's Hospital), in which death could be imputed to hemorrhage, notwithstanding the bleeding has often been so profuse, and from so deep a source, just after the operation, as to create suspicion, that it proceeded from the internal pudendal artery. Such hemorrhage generally stopped before the patient was put to bed.

The majority of patients who die after lithotomy, perish of peritoneal inflammation. Hence, on the least occurrence of tenderness over the abdomen, copious venesection should be put in practice. At the same time, eight or ten leeches should be applied to the hypogastric region. The belly should be fomented, and the bowels kept open with the oleum ricini. The feebleness of the pulse should not deter the practitioner from using the lancet; this symptom is only fallacious; and it is attendant on all inflammation within the abdomen. Together with the above measures, the warm bath, a blister on the lower part of the abdomen, and emollient glysters, are highly proper. I have seen several old subjects die of the irritation of a diseased thickened bladder, continuing after the stone was extracted. They had not the acute symptoms, the inflammatory fever, the general tenderness and tension of the abdomen, as in cases of peritonitis; but they referred their uneasiness to the lower part of the pelvis; and instead of dying in the course of two or three days, as those usually do, who perish of peritoneal inflammation, they, for the most part, lingered for two or three weeks after the operation. In these cases, opiate glysters, and blistering the hypogastric region, are the best measures. In some instances of this kind, abscesses form about the neck of the bladder.

Whoever wishes to acquire a perfect knowledge of the history of lithotomy should consult the following works: *Celsus de Re Medicâ. lib.* 7. *cap.* 26. *Remarques sur la Chirurgie de Chauliac, par M. Simon de Mingelouzeaux, tom.* 2.; *Bourdeaux,* 1663. *La Legende du Gascon par Drelincourt; Paris,* 1665. *Van Horne's Opuscula. Marianus de Lapide Vesicæ per Incisionem extrahendo;* 1552. *Parallèle des Différentes Manières de tirer la Pierre hors de la Vessie;* 1730. *Sharp's Operations. Sharp's Critical Enquiry. Le Dran's Operations, Edit.* 5; *London,* 1781. *Franco's Traité des Hernies;* 1561. *Rosetus de Partu Cæsario. Traité de la Lithotomie, par Tolet. Heister's Surgery, Part* 2. *Lithotomia Dou-*

*glassiana*; 1723. *Morand de alto Apparatu. Observations sur la Manière de Tailler, &c. pratiquée par Frère Jacques; par J. Mery. Cours d'Opérations de Chirurgie par Dionis. Traité des Opérations par Garengeot, tom. 2. Morand Opuscules de Chirurgie. Bertrandi Traité des Opérations. Index Supellectilis Anatomicæ Ravianæ; Leidæ*, 1725. *Le Cat, Recueil de Pièces sur l'Opération de la Taille, Part* 1; *Rouen*, 1749. *Cosme, Recueil de Pièces Anatomiques importantes sur l'Opération de la Taille; Paris*, 1751—1753. *J. Douglas, Postscript to Hist. of the Lateral Operation*; 1726. *Cheselden's Anatomy*, 1730; *and subsequent editions. J. Douglas, Appendix to Hist. of the Lateral Operation*; 1731. *A short Historical Account of Cutting for the Stone, by W. Cheselden, in his own last Edition of his Anatomy. Falconet in Thes. Chirurg. Halleri; thes.* 103, *t.* 4, *p.* 196. *Hartinkeil; Tractatus de Vesicæ Urinariæ calculo, &c.* 1785. *Traité Historique et Dogmatique de l'Opération de la Taille par J. F. L. Deschamps, in four vols.* 8*vo, Paris*, 1796. *This last work is a very complete and full account of the subject up to the time of its publication, and well merits a careful perusal. Richerand's Nosographie Chirurgicale, tom.* 3, *p.* 538, *&c. Edit.* 4. *Levéillé's Nouvelle Doctrine Chirurgicale, tom.* 3, *p.* 533. *John Bell's Principles of Surgery, Vol.* 2. *Part* 1. *Burns, in Edinb. Med. and Surg. Journal, January*, 1808. *C. Bell's Operative Surgery, Vol.* 1, 1807. *Sabatier, de la Médecine Opératoire, tom.* 3, *Edit.* 3, 1810. *Dr. Thomson's Observations on Lithotomy; Edinb.* 1808. *Allan's Treatise on Lithotomy; Edinb.* 1808. *Earle's Practical Observations on the Stone*; 1796. *Edit.* 2. *Œuvres Chirurgicales de Desault par Bichat; tom.* 2. *Roux Voyage fait à Londres en* 1814, *ou parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 315, *&c. Paris*, 1815. For a minute description and delineations of the parts concerned in the operation, see *Camper's Demonstrationes Anatomico-pathologicæ, lib.* 2.

**LOTIO ALUMINIS.**—℞. Aluminis purif. ℥ss. Aquæ distillatæ lbj. Misce.—Sometimes used as an astringent injection; sometimes as an application to inflamed parts.

**LOTIO AMMONIÆ ACETATÆ.**—℞. Aquæ ammon. acetatæ; Spirit. vin. rectif.; Aquæ distillatæ; sing. ʒiv. Misce. —Properties discutient.

**LOTIO AMMONIÆ MURIATÆ.**—℞. Ammon. muriatæ ℥j. Spirit. rorismarini ℔j.—Has the same virtues as the preceding. Justamond recommended it in the early stage of the milk-breast.

**LOTIO AMMONIÆ MURIATÆ CUM ACETO.**—℞. Ammon. Mur. ℥ss. Aceti, Spirit. vinos. rectif. sing. ℔j. Misce. This is one of the most efficacious discutient lotions. It is, perhaps, the best application for promoting the absorption of extravasated blood, in cases of ecchymosis, contusions, sprains, &c.

**LOTIO AMMONIÆ OPIATA.**—℞. Spiritus ammon. comp. ℥iiiss. Aquæ distillatæ ℥iv. Tinct. Opii ℥ss. Misce.—Applied by Kirkland to some suspicious swellings in the breast, soda and bark being also given internally.

**LOTIO CALCIS COMPOSITA.**—℞. Aquæ calcis ℔j. Hydrargyri muriati ʒj. Misce.—Properties strongly astringent. Ring-worms, tetters, and some other cutaneous affections yield to this application, which, however, should generally be diluted. In the latter state, it may occasionally be used as an injection for various purposes.

**LOTIO GALLÆ.**—℞. Gallarum contusarum ʒij. Aquæ ferventis ℔j. To be macerated one hour, and strained.—This astringent lotion is sometimes used with a view of removing the relaxed state of the parts, in cases of prolapsus ani, prolapsus uteri, &c.

**LOTIO HYDRARGYRI AMYGDALINA.**—℞. Amygdalarum amararum ℥ij. Aquæ distill. ℔ij. Hydrarg. mur. ℈j. Rub down the almonds with the water, which is to be gradually poured on them; strain the liquor, and then add the muriated mercury. This will cure several cutaneous herpetic affections.

**LOTIO HYDRARGYRI MURIATI.** ℞. Hydrargyri muriati gr. ijss. Arabici gummi ℥ss. Aquæ distillatæ ℔j. Misce. —This is the injection of corrosive sublimate in use at St. Bartholomew's Hospital.

**LOTIO HYDRARGYRI MURIATI COMPOSITA.**—℞. Hydrarg. mur. gr. x. Aq. distillat. bullientis ℥iss. Tinct. canthar. ℥ss. Misce.—This was ordered by Dr. H. Smith, to be applied every night to scrophulous swellings.

**LOTIO HELLEBORI ALBI.**—R. Decocti hellebori albi ℔j. Kali sulphurati ℥ss. Misce.—This is occasionally employed as an application for curing tinca capitis, and some other cutaneous diseases.

**LOTIO KALI SULPHURATI.**—℞. Kali sulph. ʒij. Aquæ distill. ℔j. Misce. —It is used in the same cases as the preceding application.

**LOTIO LITHARGYRI ACETATI.** ℞. Aquæ litharg. acet. ʒij. Ac. distill. ℔ij. Spirit. vinos. tenuioris ʒij. The first and the last ingredients are to be mixed before the water is added.

This is the common whitewash, an application, that is so universally known as the usual saturnine application in cases of inflammation, &c. that we need say nothing more concerning it.

**LOTIO OPII.**—℞. Opii purif. ʒjss Aquæ distillatæ ℔j. Misce.—A very excellent application to irritable painful ulcers of every description. It is best to dilute it, especially, at first.

**LOTIO PICIS.**—℞. Picis liquidæ ℥iv. Calcis ℥vj. Aquæ ferventis ℔iij.—To be boiled till half the water is evaporated. The rest is then to be poured off for use. This application is sometimes employed for the cure of tinea capitis; it is also of singular service in removing an extensive scorbutic redness, frequently seen on the legs, together with old ulcers.

**LOTIO ZINCI VITRIOLATI.**—℞. Zinci Vitriolati ʒj. Aq. ferventis ℔j. Misce. This is sometimes used by practitioners in lieu of the lotio aq. litharg. acet. The free external application of lead has sometimes been suspected of bringing on bad effects, in consequence of absorption; and some surgeons, therefore, advise the employment of this lotion instead of it, which, in all probability, also, is equally efficacious. When diluted, by adding two pints more water, it forms the common injection, so much recommended in cases of gonorrhœa.

**LUES VENEREA.** See VENEREAL DISEASE.

**LUMBAR ABSCESS.** *Psoas Abscess.* By these terms are understood chronic collections of matter, which form in the cellular substance of the loins, behind the peritonæum, and descend in the course of the psoas muscle. Patients, in the incipient stage of the disease, cannot walk so well as usual; they feel a degree of uneasiness about the lumbar region; but in general, there has been no acute pain, even when the abscess has acquired such a size as to form a large tumour, protruding externally. In short, the psoas abscess is the best instance, which can possibly be adduced, in order to illustrate the nature of those collections of matter, which are called chronic, and which form in an insidious manner, without serious pain, or any other attendant of acute inflammation.

The abscess sometimes forms a swelling above Poupart's ligament; sometimes below it; and frequently the matter glides under the fascia of the thigh. Occasionally, it makes its way through the sacro-ischiatic foramen, and assumes rather the appearance of a fistula in ano. When the matter gravitates into the thigh, beneath the fascia, Mr. Hunter would have termed it a disease *in,* not *of,* the part. The uneasiness in the loins, and the impulse communicated to the tumour by coughing, evince, that the disease arises in the lumbar region; but, it must be confessed, that we can hardly ever know the existence of the disorder, before the tumour, by presenting itself externally, leads us to such information. The lumbar abscess is sometimes connected with diseased vertebræ, which may either be a cause, or an effect, of the collection of matter.—The disease, however, is frequently unattended with this complication.

The disease of the spine, we may infer, is not of the same nature as that treated of by Pott, as there is usually no paralysis. When the bodies of patients with lumbar abscesses are opened, it is found, that the matter is completely enclosed in a cyst, which, in many cases, is of course, very extensive. If the contents of such abscesses were not circumscribed by a membranous boundary in this manner, we should have them spreading among the cells of the cellular substance, just like the water in anasarca. The cysts are both secreting and absorbing surfaces, as is proved by the great quantity of matter, which soon collects again after the abscess has been emptied, and by the occasional disappearance of large palpable collections of matter of this kind, either spontaneously, or in consequence of means which are known to operate by exciting the action of the absorbents. In short, the cyst becomes the suppurating surface, and suppuration is now well ascertained to be a process, similar to glandular secretion. While the abscess remains unopened, its contents are always undergoing a change; fresh matter is continually forming, and a portion of what was in the cyst before, is undergoing an incessant removal by the absorbents. This is not peculiar to lumbar abscesses; it is common to all, both chronic and acute, buboes and suppurations in general. It is true, that, in acute abscesses, there often has not been time for the formation of so distinct a membrane as the cyst of a large chronic abscess; but its matter is equally circumscribed by the cavities of the cellular substance being filled with a dense coagulating lymph; and though it generally soon makes its way to the surface, it also is occasionally absorbed.

The best modern surgeons, make it a common maxim to open very few acute abscesses; for, the matter naturally tends with great celerity to the surface of the body, where ulceration allows it to escape spontaneously; after which, the case generally goes on better, than if it had been opened by art. But, in chronic abscesses, the matter has not that strong tendency to make its way outward; its quantity is continually increasing; the cyst is, of course, incessantly growing larger and larger; in short, the matter, from one ounce, often gradually increases to the quantity of a gallon. When the disease is at length opened, or bursts by ulceration, the surface of the cyst, irritated by the change, inflames; and its great extent, in this circumstance, is enough to account for the terrible constitutional disorder, and fatal consequences, which too frequently soon follow the evacuation of the contents of such an abscess. Hence, in cases of chronic suppurations of every kind, and not merely in lumbar abscesses, it is the surgeon's duty to observe the opposite rule to that applicable to acute cases: and he is called upon to open the collection of matter, as soon as he is aware of its existence, and its situation will allow it to be done.

Certainly, it would be highly advantageous to have some means of ascertaining whether the vertebræ are also diseased; for, as in this instance, the morbid bones would keep up suppuration, until their affection had ceased, and there would be no reasonable hope of curing the abscess sooner, it might be better to avoid puncturing it under such circumstances. The propriety of this conduct seems the more obvious, as issues, which are the means most likely to stop and remove the disease of the spine, are also such as afford most chance of bringing about the absorption of the abscess itself. However, if the collection cannot be prevented from discharging itself, and ulceration is at hand, it is best to meet the danger, make an opening with a lancet, in a place at some distance from where the pointing threatens, and afterwards heal it, in the way we shall presently detail.

Though we have praised the prudence of opening all chronic abscesses while small, the deep situation of the lumbar one, and the degree of doubt always involving its early state, unfortunately prevent us from taking this beneficial step in the present case. But, still the principle is equally praiseworthy, and should urge us to open the tumour as soon as the fluctuation of the matter is distinct, and the nature of the case is evident. For this purpose, Mr. Abernethy employs an abscess lancet, which will make an opening large enough for the discharge of those flaky substances so frequently found blended with the matter of lumbar abscesses, and by some conceived to be an emblem of the disease being scrophulous. Such flakes seem to consist of a part of the coagulating matter of the blood, and are very commonly secreted by the peculiar cysts of scrophulous abscesses. The puncture must also be of a certain size, in order to allow the clots of blood, occasionally mixed with the matter, to escape. Mr. Abernethy considers the opening of a lumbar abscess, a very delicate operation. Former surgeons used to make large openings in these cases; let out the contents; leave the wound open; the usual consequences of which were, great irritation and inflammation of the cyst; immense disturbance of the constitution; putrefaction of the contents of the abscess, in consequence of the entrance of air into its cavity; and, too often, death. While such practice prevailed, very few afflicted with lumbar abscesses, were fortunate enough to escape. The same alarming effects resulted from allowing the abscess to attain its utmost magnitude, and then burst by ulceration. If then a more happy train of events depend upon the manner, in which lumbar abscesses are punctured, the operation is certainly a matter of great delicacy.

Until the collection is opened, or bursts, the patient's health is usually little, or not at all impaired; indeed, we see in the faces of many persons with such abscesses, what is usually understood by the picture of health. Hence, how likely our professional conduct is to be arraigned, when great changes for the worse, and even death, occur very soon after we have let out the matter, seemingly, and truly, in consequence of the operation. Every plan, therefore, which is most likely to prevent these alarming effects, is entitled to infinite praise; and such, I conceive, is the practice recommended by Mr. Abernethy.

This gentleman's method is to let out the matter, and heal the wound immediately afterwards by the first intention. He justly condemns all introductions of probes, and other instruments, which only irritate the edges of the puncture, and render them unlikely to grow together again. The wound is to be carefully closed with sticking plaster, and it will almost always heal.

These proceedings do not put a stop to the secretion of matter within the cavity of the abscess. Of course, a fresh accumulation takes place; but, it is obvious that the matter, as fast as it is produced, will gravitate to the lowest part of the cyst, and, consequently, the upper part will remain for a certain time undistended, and have an opportunity of contracting.

When a certain quantity of matter has again accumulated, and presents itself in the groin, or elsewhere, which may be in about a fortnight after the first puncture, the abscess is to be punctured again, in the same manner as before, and the wound healed in the same way. The quantity of matter will now be found much less, than what was at first discharged. Thus the abscess is to be repeatedly puctured at intervals, and the wounds as regularly healed by the first intention, by which method, irritation and inflammation of the cyst will not be induced, the cavity of the matter will never be allowed to become distended, and it will be rendered smaller and smaller, till the cure is complete.

In a few instances, you may, perhaps, be unable to persevere in healing the repeated punctures which it may be necessary to make; but, after succeeding once or twice, the cyst will probably have enjoyed sufficient opportunity to have contracted itself so much, that its surface will not now be of alarming extent. It is also a fact, that the cyst loses its irritability, and becomes more indolent, and less apt to inflame, after the contents have been once or twice evacuated, in the above way its disposition to absorb becomes also stronger.

The knowledge of the fact, that the cysts of all abscesses are absorbing surfaces, should lead us never to neglect other means, which Mr. Abernethy suggests, as likely to promote the dispersion of the abscess, by quickening the action of the absorbents. Blisters kept open with savine cerate, issues, electricity, occasional vomits of zincum vitriolatum, are the means most conducive to this object. When the vertebræ are diseased, issues are doubly indicated.

In the latter complication, the case is always dangerous. If an opening should have been made in the abscess, the cyst is at first more likely to be irritated, than when the bones are not diseased, and the affection of the spine is rendered much less likely to undergo any improvement, in consequence of the mere formation of an outward communication. The same bad effect attends necrosis; in which case, the absorption of the dead bone is always retarded by the presence of unhealed fistulæ and sores, which lead down to the disease.

Mr. Crowther has succeeded in dispersing some large lumbar abscesses without opening them. Large blisters, applied to the integuments covering the swelling, and kept open with the savine cerate, effected the cure. When this gentleman punctures such collections of matter, he uses a small trocar, which he introduces at the same place as often as necessary. He observes, that the aperture so made does not ulcerate, and allows no matter to escape after being dressed. I cannot, however, discover any reason for his preferring the trocar to the abscess lancet, except that the cannula enables the surgeon to push back with a probe any flakes of lymph, &c. which may obstruct its inner orifice. But, this is scarcely a reason, when Mr. Abernethy informs us, that the opening, made with an abscess lancet, is large enough to allow such flakes to be discharged; and, when they stop up the aperture, a probe might also be employed to push them back. A wound made with a cutting instrument will, *cæteris paribus*, always more certainly unite, by the first intention, than one made with such an instrument as a trocar. Mr. Crowther may always have succeeded in healing the aperture; but, I do not believe, that other practitioners would experience equal success. Were the tumour not very prominent, from the quantity of matter being small, suddenly plunging in a trocar might even endanger parts, which should, on no account, be injured.

Some writers recommend opening lumbar abscesses with a seton. The matter being made to form as prominent a swelling as possible, by pressing the abdomen, and putting the patient in a position, which will make the contents of the abscess gravitate towards the part where the seton is to be introduced, a transverse cut is first to be made in the integuments down to the fascia. A flat trocar is next to be introduced within the incision, which should only be just large enough to allow the instrument to pass freely up under the skin, for at least three quarters of an inch; when the hand is to be raised, and the trocar pushed obliquely and gently upwards, till the cannula is within the lower part of the sac. The trocar must now be withdrawn, and the matter allowed to flow out gently, stopping it every now and then for some minutes. The assistant must now withdraw his hand, to take away the pressure, and the thumb of his left hand upon the opening of the cannula, holding it between his fore and middle fingers. It must then be pushed upward, nearly to the top of the tumour, where its end may be distinctly felt with the fore-finger of the right hand. As soon as it can be plainly felt, it must be held steadily in the same position, and the trocar is to be introduced into it again, and pushed through the skin, at the place where it is felt, and the cannula along with it. The trocar being next withdrawn, a probe, with a skein of fine soft silk, dipped in oil, must be passed through the cannula, which being now taken away, leaves the seton in its place. A pledget of a mild ointment is then to be applied over the two openings, the more completely to exclude the air. A fresh piece of the silk is to be drawn into the abscess, and that which was in before, cut off, as often as necessary. (See *Latta's System of Surgery, Vol. 3, p.* 307.)

Mr. Crowther states, that Deckers, who wrote in 1696, discharged a large abscess, in a gradual manner, with a trocar, the cannula of which was not withdrawn, but was stopped up with a cork, and the latter let out at intervals. B. Bell also advises the cannula not to be taken out.

I cannot quit this subject without mentioning a remarkable case of lumbar abscess, which I once saw in Christ's Hospital, under the care of Mr. Ramsden. The tumour extended from the ilium and sacrum below, as high up as the ribs. The diameter of the swelling, from behind forward, might be about six or eight inches. It was attended with so strong a pulsation, corresponding with that of the arteries, that several eminent surgeons in this city considered the case as an aneurism of the aorta. After some weeks, as the tumour increased in size, the throbbing of the whole swelling gradually became fainter and fainter, and, at length, could not be felt at all. The tumour was nearly on the point of bursting. Mr. Ramsden suspected, that it was an abscess, and determined to make a small puncture in it. The experiment verified the accuracy of his opinion; a large quantity of pus was evacuated at intervals; but, the boy's health suffering, he went to his friends at Newbury, and I did not afterwards hear the event. I have never seen any popliteal aneurism, whose pulsations could be more plainly seen and strongly felt, than those of the abscess we have just been describing.

I shall conclude with expressing my decided preference to Mr. Abernethy's plan of treating lumbar abscesses.

Consult *Abernethy's Surgical and Physiological Essays, Part* 1. *and* 2. *Crowther's Observations on White Swelling, &c.* 1808. *Latta's System of Surgery, Vol.* 3. *Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 1, *p.* 370. *Pearson's Principles of Surgery, p.* 102, *Edit.* 2. *Richter's Anfangsgrunde der Wundarzneykunst, B.* 5, *p.* 113, *Göttingen*, 1801.

**LUNAR CAUSTIC.** (See *Argentum Nitratum.*)

**LUPUS.** See *Noli me tangere.*

**LUXATION.** (from *luxo*, to put out of joint.) A dislocation. See this word.

# M.

**MAMMA, REMOVAL OF.** The operation of cutting away a diseased breast, is done nearly in the same manner as the removal of tumours in general, and is indicated whenever the part is affected with an incurable disease, which admits, however, of being entirely removed with the knife. When the breast is affected with scirrhus, or ulcerated cancer, the imprudence of tampering with the disease cannot be too severely censured. Were the disorder unattended with a continual tendency to increase, some time might properly be dedicated to the trial of the internal remedies, and external applications, which have acquired any character for doing good in these unpromising cases. But, unfortunately, by endeavouring to cure the disease by medicine, we only afford time for it to increase in magnitude, and, at length, to attain a condition, in which even the knife cannot be employed so as to take away the whole of the diseased parts. When the case is marked by those characteristic features, of scirrhus, which are noticed in the article *Cancer*, the sooner the tumour is cut out, the better. There are also some malignant kinds of sarcoma, to which the female breast is subject, (as will be explained in the article *Tumour*,) which cannot be removed at too early a period after their nature is suspected or known. Indeed, though there is not equal urgency for the operation when the tumour is only an indolent, simple, fatty, or sarcomatous disease, yet, as all these tumours are continually growing larger, and little success attends the attempt to disperse them, the practitioner should never devote much time to the trial of unavailing medicines and applications, and let the swelling attain a size, which would require a formidable operation for its excision. Besides, every simple, fleshy, indolent tumour, is always accompanied with a certain hazard of changing into a malignant, or cancerous one.

Certainly, there are many swellings and indurations of the breast, which it would be highly injudicious and unnecessary to extirpate, because they generally admit of being discussed. Such are many tumours, which are called *scrophulous*, from their affecting patients of this peculiar constitution; such are nearly all those indurations, which remain after a sudden and general inflammatory enlargement of the mamma; such are most other tumours, which acquire their full size in a few days, attended with pain, redness, &c.; and, of this kind, also, are the hardnesses in the breast, occasioned by the mammary abscess.

In the removal of all tumours, their malignant or cancerous nature makes it necessary to observe one important caution in the operation, viz. not to rest satisfied with cutting away the tumours just at their circumference; but to take away also a considerable portion of the substance, in which they lie, and with which they are surrounded. In cutting out a cancerous breast, if the operator were to be content with merely dissecting out the disease, just where his eyes and fingers might equally lead him to suppose its boundary to be situated, there would still be left behind white diseased bands, which radiate from the tumour into the surrounding fat, and which would inevitably occasion a relapse. In a vast proportion of the cases also, in which cancer of the breast unfortunately recurs after the operation, it is found, that the skin is the part, in which the disease makes its reappearance, Hence, the great prudence of taking away a good deal of it in every case suspected to be a truly scirrhous or cancerous disease. This may also be done so as not to prevent the important objects of uniting the wound by the first intention, and covering the whole of its surface with sound integuments. So frequently does cancer recur in the nipple, whenever it does recur any where, that many of the best modern operators always make a point of removing this part in every instance, in which it is judged expedient to take away any portion of the skin at all. The surgeon, indeed, would be inexcusable, were he to neglect to take away such portion of the integuments covering scirrhous tumours, as is evidently affected, appearing to be discoloured, puckered, and closely attached to the diseased lump beneath. Nor should any gland, in the axilla, at all diseased, nor any fibres of the pectoral muscle, in the same state, be ever left behind. There is no doubt, that nothing has stamped operations for cancers with disrepute, so much as the neglect to make a free removal of the skin, and parts surrounding every side of the tumour. Hence the disease has frequently appeared to recur, when, in fact, it has never been thoroughly extirpated; the disease, though entirely a local affection, has been deemed a constitutional one; and the operation frequently rejected as ineffectual and useless.

But, strongly as I have urged the prudence, the necessity of making a free removal of the skin covering, and of the parts surrounding, every cancerous or malignant tumour, the same plan may certainly be regarded as unnecessary, and, therefore, unscientific, in most operations for the removal of simple, fatty, or fleshy tumours. However, even in the latter cases, when the swelling is very large, it is better to take away a portion of skin; for, otherwise, after the excision of the tumour, there would be a redundance of integuments, the cavity of which would only serve for the lodgment of matter. The loose superfluous skin also would lie in folds, and not apply itself evenly to the parts beneath, so as to unite favourably by the first intention; nor could the line of the cicatrix itself be arranged with such nice evenness as it might be, were a part of the redundant skin taken away at the time of operating.

The best method of removing a diseased breast is as follows: The patient is usually placed in a sitting posture, well supported by pillows and assistants; but the operator would find it equally convenient, if not more so, to remove the tumour with his patient in a recumbent position; and it certainly is better whenever the operation is likely to be long, or much blood to be lost, which circumstances are very apt to bring on fainting. I remember, that Mr. Abernethy, in his lectures, used to recommend the latter plan; which, however, without the sanction of any great name, or authority, possesses such obvious advantages, as will always entitle it to approbation.

The arms should be confined back, by placing a stick between them and the body, by which means, the fibres of the great pectoral muscle will be kept on the stretch, a state most favourable for the dissection of the tumour off its surface. The stick also prevents the patient from moving her arm about, and interrupting the progress of the operation.

When the tumour is not large, and only a simple sarcoma, free from malignancy, it will be quite unnecessary to remove any of the skin, and, of course, this need only be divided by one incision, of a length proportionate to the tumour. The cut must be made with a common dissecting knife; and, as the division of the parts is chiefly accomplished with the part of the edge towards the point, the instrument will be found to do its office best when the extremity of the edge is made of a convex shape, and this part of the blade is turned a little back, in the way in which dissecting knives are now often constructed. The direction of the incision through the skin should be made according to the greatest diameter of the tumour to be removed, by which means it will be most easily dissected out.

The direction of the incision is various with different practitioners; some making it perpendicular, others transverse. In general, the shape of the tumour must determine which is the best. In France, it has been said, that when the incision follows the second direction, it heals more expeditiously, because the skin is more extensible from above downward, than laterally, particularly towards the sternum, and, consequently allows the sides of the wound the more readily to be placed in contact; and that the action of the pectoral muscle tends to separate the edges of the wound when it is perpendicular. On the other hand, it is allowed, that the wound, made in the latter manner, is the most favourable for the escape of the discharge, if suppuration should occur. (See *Desault par Bichat, p.* 312. *Tom.* 2.)

The cut through the skin should always be somewhat longer than the tumour; and as it is, perhaps, the most painful part of the operation, and one attended with no danger whatever, it should be executed with the utmost celerity. Pain is certainly more or less to be dreaded, according to its duration. The fear, however, of giving pain has probably led many operators to err, by not making their first incision through the integuments large enough, the consequence of which has often been, that there was not room enough to get at the tumour so as to dissect it out with facility; the patient has been kept nearly an hour in the operating room, instead of five minutes, and the surgeon censured by the spectators, as awkward and tedious. It is clear, also, that, besides the great deal more blood lost, from this error, than would otherwise happen, the vessels being commonly not tied till all the cutting is finished, the avoidance of pain, that fear, which led to the blunder, is not effected, and the patient suffers much more, and for a much longer time, in consequence of the embarrassment and obstacles in the way of the whole operation.

When the disease is of a scirrhous or malignant nature, the skin covering the tumour should, at all events, be in part removed. As I have said before, all that portion which is discoloured, puckered, tuberculated, or otherwise altered, should be taken away. Some must also be removed, in order to prevent a redundance, in all cases in which the tumour is large. We have said too, that in cases of scirrhus and cancer of the breast, the nipple is considered a dangerous part to be left behind. For the purpose of removing the necessary portion of skin, the surgeon must obviously pursue a different mode from that above described; and, instead of one straight incision, he is to make two semicircular cuts, one immediately after the other, and which are to meet at their extremities. The size of these wounds must be determined by that of the disease to be removed, and by the quantity of skin, which it is deemed prudent to take away; for the part, which is included in the two semicircular cuts, is that which is not to be separated from the upper surface of the swelling, but taken away with it. The shape of the two cuts together may approach that either of a circle or oval, as the figure of the tumour itself may indicate, as most convenient. The direction of the incisions is to be regulated by the same consideration.

In the above ways, the first division of the integuments is to be made in removing tumours of every description, covered with skin. The same principles and practice should prevail in all these operations; and, whether the swelling is the mamma, or any other diseased mass, whether situated on the chest, the back, the head, or extremities, the same considerations should always guide the operator's hand.

The incision, or incisions, in the skin having been made, the next object is to detach every side of the tumour from its connexions, and the separation of its base will then be the last and only thing remaining to be done. When the tumour is a scirrhus, or other malignant disease, the operator must not dissect close to the swelling, but make his incisions on each side, at a prudent distance from it, so as to be sure to remove, with the diseased mass, every atom of morbid mischief in its vicinity. But, when the tumour is only a mere fatty, or other mass, perfectly free from malignancy, the cellular bands and vessels forming its connexions, may be divided close to its circumference. It is astonishing with what ease fatty tumours are removed, after the necessary division is made in the skin; they may almost be turned out with the fingers, without any cutting at all. When they have been inflamed, however, they are then more adherent to the surrounding parts.

Thus we see, that the first stage of the operation of removing a tumour, is the division of the skin; the second, the separation of the swelling from the surrounding parts on every side; the third and last stage is the division of the parts to which its under surface, or base, is attached. The latter object should be accomplished by cutting regularly from above downward, till every part is divided.

It is a common thing to see many operators constantly embarrassed and confused, whenever they have to remove a large tumour, on account of their having no particular method in their proceedings. They first cut a few fibres on one side, then on another; and, turning the mass of disease now to this side, now to that, without any fixed design, they both prolong the operation very tediously, and present to the bystanders a complete specimen of surgical awkwardness. On the contrary, when the practitioner divides the cutting part of the operation into the three methodical stages, above recommended, in each of which there is a distinct object to be fulfilled, he proceeds with a confidence of knowing what he is about, and soon effects what is to be done, with equal expedition and adroitness.

Having taken out the tumour, the operator is immediately to tie such large vessels as may be pouring out their blood; indeed, when the removal of the swelling will necessarily occupy more than three, or four minutes, it is better to tie all the large arteries as soon as they are divided, and then proceed with their dissection. This was the celebrated Desault's plan, and it is highly deserving of imitation in this country, not only because many subjects cannot afford to lose much blood, but also because the profuse effusion of this fluid keeps the operator from seeing what parts he is dividing.

The largest arteries being tied, the surgeon should not be immediately solicitous about tying every bleeding point which may be observed. Instead of this, let him employ a little while in examining every part of the surface of the wound, in order to ascertain that no portion of the swelling, no hardened lump, nor diseased fibres remain behind. Even if any part of the surface of the pectoral muscle should present a morbid feel, or appearance, it must, on every account, be cut away. Also, if any of the axillary glands are diseased, the operator should now proceed to remove them. After the time spent in such measures, many of the small vessels, which bled just after the excision of the swelling, will now have stopped, the necessity for several ligatures will be done away, and, of course, the patient saved a great deal of pain, and more of the wound be likely to heal by the first intention.

Some information may be derived, respecting whether any of the tumour is left behind, by examining its surfaces, when taken out, and observing whether any part of them is cut off; for, if it is, it may always be found in the corresponding part of the wound.

The axillary glands may invariably be taken out, without the least risk, if the plan pursued by Desault in France, and Sir Charles Blicke, and other eminent surgeons in this country, be adopted. The method alluded to, is, after dividing the skin covering the gland, and freeing the indurated part from its lateral connexions, to tie its root, or base, by which it is connected with the parts on the side towards the cavity of the axilla. Then the indurated gland itself may be safely cut off, just above the ligature. Were the gland cut off in the first instance, the artery which supplies it with blood would be exceedingly difficult to tie, on account of its deep situation; and, by reason of its shortness and vicinity to the heart, it would bleed almost like a wound of the thoracic artery itself. In this way, there is also not the least hazard of injuring the latter vessel. It would be a great improvement in the mode of operating for the removal of these glands, if surgeons were always to make the patient lie down, with the arm placed in such a position as would let the light fall into the axilla. How much the steps of the operation would be facilitated in this way, I need not attempt to explain.

The above directions will enable a surgeon to remove tumours in general. They apply also in a great measure to *encysted tumours*; but, a few particular rules how to operate in the latter cases, will be found in the article *Tumours.* One half of each ligature is always to be cut off before dressing the wound. The edges of the incision are to be brought together with strips of adhesive plaster; and, before this can be done with ease, the stick confining the arm back must be removed, and the os brachii brought forward, so as to relax the pectoral muscle, and integuments of the breast. No sutures should ever be employed, as they are useless, painful, and irritating. The wound being closed with sticking plaster, and a pledget of simple cerate, a compress of folded linen, or flannel, may be put over the dressings; these are to be secured with a broad piece of linen, which is to encircle the chest, be fastened with pins, or stitches, and kept from slipping down by two tapes, one of which is to go from behind forward, over each shoulder, and be stitched to the upper part of the bandage, both in front and behind. The arm on the same side as that on which the operation has been done should be kept perfectly motionless, in a sling; every motion of the limb must evidently disturb the wound, by putting the great pectoral muscle into action, or rendering its fibres sometimes tense, sometimes relaxed. It is scarcely necessary to say, that, after so considerable an operation as the removal of a large breast, or any other tumour of magnitude, the patient should be given about thirty drops of the tinctura opii. A smaller dose always creates restlessness, head-ach, and fever, after operations, instead of having the desired effect.

Here it becomes me to state, that as I could not find, in any surgical book, with which I am acquainted, what I conceived to be a proper description of the mode of removing a diseased breast, and tumours in general, the foregoing remarks are given chiefly on my own authority. Whether they are just, or not, must be decided by the profession.

The principal writers on the removal of the mamma are, Garengeot, Dionis, Le Dran, Bertrandi, Sharp, and Sabatier, in their respective treatises on the operations. B. Bell, Latta, &c. have also treated of the subject in their Systems of Surgery; and there is a memoir *Sur l'Operation du Cancer au Sein,* in *Les Œuvres Chirurgicales de Desault par Bichat, Tom.* 2.

MAMMARY ABSCESS. *Milk Abscess.* Women who suckle, are particularly subject to inflammation and suppuration in the breast. The part enlarges, becomes tense, heavy, and painful. The integuments of the breast sometimes assume an uniform redness; sometimes they are only red in particular places. The inflammation may affect the mammary gland itself, or be confined to the skin and surrounding cellular substance. In the latter case, the inflamed part is equally tense; but, when the glandular structure of the breast is also affected, the enlargement is irregular, and seems to consist of one or more large tumours, situated in the substance of the part. The pain often extends to the axillary glands. The secretion of the milk is not always suppressed, when the inflammation is confined to the integuments, and suppuration is said to come on more quickly, than in the affections of the mammary gland itself. When the symptoms of inflammation continue to increase for four or five days, suppuration may be expected; unless the progress of the inflammation be slow, and its degree moderate, in which circumstances, resolution may often be obtained, even as late as a fortnight after the first attack. Inflammations of the breast, are almost always attended with symptoms of the sympathetic inflammatory fever. (See *Fevers, Surgical.*) I think authors err, who describe the febrile disorder as generally preceding the local complaint.

Women are most liable to mammary abscesses within the first three months after parturition; but they are also very much exposed to the disorder as long as they continue to suckle.

The most common causes occasioning the mammary abscess, as enumerated by writers in general, are, repressing the secretion of milk at an early period, mental disturbance, fright, &c.; exposure to cold, moving the arms too much while the breasts are very large and distended, bruises, and other external injuries. The causes are not always assignable.

The matter is sometimes contained in one cyst, or cavity; sometimes in several; but the abscess generally breaks near the nipple.

As all inflammations of the mamma are attended with considerable induration, these cases should be carefully distinguished from other swellings of a more incurable kind. It is said, that scrophulous tumours of the mamma, which have existed a long while, often disappear after the occurrence of a milk-abscess. Women who have never been pregnant, are sometimes affected with suppurations in the breast, not essentially different from those above described. Even men are said to be liable to similar complaints.

In the early period of the affection, resolution should be attempted. The following are the principal means for this purpose:—topical blood-letting, saline purges, low diet, keeping the inflamed breast from hanging down, gentle friction of the breast, with a soft sponge, wet with some warm emollient liquor, having the milk tenderly sucked out at proper intervals; saturnine applications, or lotions containing sal ammoniac.

When matter cannot be prevented from forming, an emollient poultice is the best application, and the abscess should in general be allowed to break of itself, unless of a somewhat chronic nature, in which case, it should be opened in a depending part, with a lancet. Sinuses sometimes form, in consequence of abscesses in the breast, and will not heal till freely opened with a director and curved bistoury. When the cavity of the abscess begins to fill up with granulations, the poultice may be left off, and superficial dressings applied.

The indurations, often remaining in the breast, in consequence of acute inflammation and abscesses, generally yield to frictions with camphorated mercurial ointment, the application of a piece of soap-plaster, and giving calomel, cicuta, and, as some advise, emetics.

Mr. Hey describes a very deep-seated abscess of the breast, not of frequent occurrence, and not confined to pregnant nor suckling women. Its situation renders all superficial applications ineffectual. The inflammatory stage is tedious; and when the matter has made its way outward, the discharge continues, and there is no tendency to healing. Sometimes the matter lodges behind the mamma, as well as in the substance of the gland, and breaks out in different places, the intermediate parts of the breast feeling as if affected with a scirrhous hardness. There are numerous sinuses running in different directions, and, when opened, a soft purple fungus appears within them. The disease goes on in this state, for a long while, keeping up hectic symptoms.

Mr. Hey's practice is to trace the course of all the numerous sinuses, and lay them open, and unless this is done, with respect to every one of them, the cure cannot be accomplished. If he finds any two sinuses running in such directions, that when fully opened, they leave a small part of the mamma in a pendulous state, he removes such part entirely. As the sinuses are filled with fungus, their continuations present no visible cavity, and can only be detected by the greater softness of parts of the wound, where, on breaking down the fungus, the orifice of the collateral sinus may be found. Mr. Hey has found, that even in the most unfavourable subjects, the wounds heal quickly, and the natural shape of the breast is preserved.

Consult *Pearson's Principles of Surgery, Chap.* 3. *Hey's Practical Observations, p.* 504. *Kirkland* has also treated of several kinds of abscesses of the breast, in his *Enquiry into the present State of Medical Surgery, Vol.* 2. *p.* 161. *Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 1, *p.* 332. The German reader may refer to *Richter's Ansfangsgr. der Wundarzn. Band.* 4. *Chap.* 16.

MELICERIS. (from μελι, honey, and κηρος, wax.) A tumour of the encysted kind, filled with a substance resembling wax, or honey, in consistence. (See *Tumours, Encysted.*)

MENINGOPHYLAX. (from μηνιγξ, a membrane, and φυλασσω, to guard.) An instrument used by the ancients for guarding the dura mater and brain from injury, in their mode of trepanning. It seems to have been something like the lenticular, only its blade was completely round, without an edge. It ended in a lentiform cup, like the latter. (*Encyclopedie Méthodique, Partie Chirurgicale.*) Pott gives a little engraving of a meningophylax, which resembles a common elevator. (See *Vol.* 1. *of his Works.*)

**MERCURY.** (*Quicksilver. Mercurius. Hydrargyrus.*) The medicinal virtues of this mineral were almost totally unknown to the ancients, who considered it as a poison. It was first employed for purposes of medicine by the Arabians, who made use of it in the form of ointments for the cure of certain diseases of the skin and the killing of vermin. In modern times, mercury is one of the most important articles of the materia medica. It has an advantage over all others in being a specific remedy for a disease, which tends more, than any other, to the destruction of the human species, and which, without this inestimable discovery, would probably have continued incurable to the present day.

Mercury, taken into the stomach in its metallic state, has no action on the body, except what arises from its weight or bulk. It is not poisonous, as was vulgarly supposed, but perfectly inert. But, in its various states of combination, it produces certain sensible effects. It quickens the circulation, and increases all the secretions and excretions.

According to circumstances, the habit of the body of the patient, the temperature in which he is kept, the nature of the preparation, and the quantity in which it is exhibited, its effects are, indeed, various. Sometimes, it more particularly increases one secretion; sometimes another; but, its most characteristic effect is the increased flow of saliva, which it generally excites, if given in sufficient quantity. (*Edinb. Dispensatory.*)

### FIRST ATTEMPTS TO ADMINISTER MERCURY.

It has been said, that the efficacy of mercury in curing the venereal disease was an accidental discovery; but, it seems more probable, that the good effects, which it produced in cutaneous diseases, first led physicians to make trial of it in venereal cases, which, frequently coming on with eruptions on the skin, ulcers, &c., seemed to present an analogy to the affections, in which mercury had already been found successful.

In the times immediately following the first origin of the venereal disease, practitioners only ventured to employ this remedy with timorous caution, so that, of several of their formulæ, mercury scarcely composed a fourteenth part, and few cures were effected. On the other hand, the empirics, who noticed the little efficacy of these small doses, ran into the opposite extreme, and exhibited mercury in quantities so large, and with such little care, that most of their patients became suddenly attacked with a most violent salivation, frequently attended with very dangerous, and even fatal symptoms; or such, as after making them lose their teeth, left them pale, emaciated, exhausted, and subject, for the rest of their lives, to tremblings, or other more or less dangerous affections. From these two very opposite modes of practice, there originated such uncertainty, respecting what could be expected from mercury, and such fears of the consequences, which might result from its employment, that every plan was eagerly adopted, which offered the least chance of cure, without having recourse to this mineral.

A medicine, however, so powerful, and whose salutary effects were seen by attentive practitioners amidst all its inconveniences, could not sink into oblivion. After efforts had been made to discover a substitute for it, and it was seen, how little confidence those means deserved, on which the highest praises had been lavished, the attempts to extend its utility were renewed. A medium was pursued, between the too timid methods of those physicians, who had first administered it, and the inconsiderate boldness of the empirics. Thus the causes, from which both parties failed, were avoided; the character of the medicine was revived in a more durable way, and, from this period, its reputation has always been maintained.

It was only about this epoch, that mercury began to be internally given: hitherto, it had only been externally employed, which was done in three manners. The first was in the form of an ointment or liniment: the second, as a plaster; and the third, as a fumigation.

The basis of the ointment, or liniment, was quicksilver, which was blended, by means of trituration, with hog's lard, goose's fat, &c. and composed scarcely one-sixth or one-eighth of the whole; a proportion, however, much greater, than what had been at first employed. But, from a fear, that the mineral might prove hurtful to the nerves, by the cold property, which they fancied it possessed, and that it might occasion numbness, tremblings, or palsies, they combined with it a multitude of ingredients of a warm, aromatic nature, or supposed to possess such; for example, oil of camomile, sesame-seeds, ani-seeds, the roots of zedoary, and the florentine iris, and a thousand other substances, which were incorporated with the ointment. The members, joints, and the whole of the body, except the head, belly, and chest, were rubbed with this composition; and the frictions were repeated, at suitable intervals, until obvious signs of salivation appeared.

The ingredients of the plasters resembled those of the ointments; only they contained less fat, for which was substituted a sufficient quantity of wax, to give them a proper consistence. This composition was applied to the skin, and the whole body was covered with it, excepting the same parts, on which it was not usual to put the ointments. The plasters were kept on, till salivation began to make its appearance.

The fumigations were made with quicksilver, triturated with turpentine, or saliva, or else with cinnabar. These substances were mixed with fatty, or resinous ones, such as myrrh, nutmeg, &c. and, all the ingredients being reduced to powder, were made into a paste, with a sufficient quantity of turpentine, or gum tragacanth. The patient was then placed in a box made on purpose, or under a little kind of tent, out of which the head was generally allowed to protrude. A chafing-dish, containing burning coals, was placed near his feet, and, every now and then, bits of mercurial paste were thrown into the vessel. The patient was left exposed to the fumes, which arose, until he broke out into a profuse perspiration, which they took great pains to keep up and increase, by putting him into a warm bed, loading him with bedding, for about two hours, after which he was rubbed quite dry, and given some food. This plan was persisted in every day, till a salivation was produced, which was kept up as long as necessary. The method of fumigation is described in Astruc, and particular preparations, and apparatuses for the purpose, have been since recommended by Lalonette in France, and, more recently, by Abernethy in England.

Of the three methods, which we have just described, only the first is at present much in use, and even this is very much altered. Experience evinced, not only, that the employment of mercurial plasters caused heat, redness, itching, and disagreeable eruptions, but, that the method was exceedingly slow and uncertain. Mercurial plasters are now only used as topical discutient applications to tumours, and indurations,

Fumigations, considered as the only means of cure, fell also into discredit, because, although they formed a method of applying mercury in a very active manner, they were, as anciently managed, liable to several objections. In this way, it was next to impossible to regulate the quantity of mercury used, which will necessarily vary, according to the greater, or lesser activity of the fire employed for making the fumigation, according to the position of the patient during the operation, and other circumstances. The effect of the vapour on the organs of respiration was often very hurtful, and mercury, applied in the way of fumigation, more frequently occasioned tremblings, palsies, &c. than in any other manner. In Mr. Abernethy's mode, however, fumigation is, under certain circumstances, not only an eligible, but, the very best, way of affecting the constitution, as we shall presently notice.

Frictions with ointment have always been regarded as the most efficacious. They have undergone considerable change, and, by being rendered more simple, have been greatly perfected. All the warm aromatic substances have been retrenched from the ointment, not only as useless, but, as irritating and inflaming to the skin. In modern times, the proportion of mercury to the fat has been very much increased.

### GENERAL REMARKS ON THE ADMINISTRATION OF MERCURY, ITS OCCASIONAL CONSEQUENCES, &C.

With regard to the preparations of the medicine, and the modes of applying it, we are to consider two things; first, the preparation and mode attended with the least trouble, or inconvenience, to the patient; and secondly, the preparation, and mode of administering it, that most readily conveys the necessary quantity into the constitution. Mercury is carried into the constitution in the same way as other substances, either by being absorbed from the surface of the body, or that of the alimentary canal. It cannot, however, in all cases be taken into the constitution in both ways; for, sometimes the absorbents of the skin will not readily receive it, at least, no effect is produced, either on the disease, or constitution, from this mode of application. In this circumstance, mercury must be given by the mouth, although the plan may be very improper in other respects, and often inconvenient. On the other hand, the internal absorbents sometimes will not take up the medicine, or, at least, no effect is produced on the disease, or the constitution.

In such cases, all the different preparations of the medicine should be tried; for, sometimes one succeeds, when another will not. In some cases, mercury seems to have no effect, either applied outwardly, or taken into the stomach. Many surfaces seem to absorb mercury better, than others; such are probably all internal surfaces and sores. Thirty grains of calomel, rubbed in on the skin, have not more effect, than three, or four, taken by the mouth. Dressing small ulcers with red precipitate sometimes causes a salivation. (See *Hunter on the Venereal Disease*, p. 335, 336.)

Besides the practicableness of getting the medicine into the constitution in either way, it is proper to consider the easiest for the patient, each mode having its convenience and inconvenience, depending on the nature of the parts, to which it is applied, or on certain situations of life at the time. Hence, it should be given in the way, most suitable to such circumstances.

In many, the bowels can hardly bear mercury at all, and it should then be given in the mildest form possible, conjoined with such medicines, as will lessen, or correct its violent local effects, although not its specific ones on the constitution.

When mercury can be thrown into the constitution with propriety by the external method, it is preferable to the internal plan, because the skin is not nearly so essential to life as the stomach, and, therefore, is capable in itself of bearing much more, than the stomach. The constitution is also less injured. Many courses of mercury would kill the patient, if the medicine were only given internally, because it proves hurtful to the stomach and intestines, when given in any form, or joined with the greatest correctors. Every one, however, has not opportunities of rubbing in mercury, and is therefore obliged, if possible, to take it by the mouth. (*Hunter, p.* 338.)

Mercury has two effects; one as a stimulus on the constitution and particular parts; the other as a specific on a diseased action of the whole body, or of parts. The latter action can only be computed by the disease disappearing.

In giving mercury in the venereal disease, the first attention should be to the quantity, and its visible effects in a given time, which, when brought to a proper pitch, are only to be kept up, and the decline of the disease to be watched; for, by this we judge of the invisible, or specific effects of the medicine, and know what variation in the quantity may be necessary. The visible effects of mercury affect, either the whole constitution, or some parts capable of secretion. In the first, it produces universal irritability, making it more susceptible of all impressions. It quickens the pulse, increases its hardness, and occasions a kind of temporary fever. In some constitutions, it operates like a poison. In some it produces a kind of hectic fever, that is, a small quick pulse, loss of appetite, restlessness, want of sleep, and a sallow complexion, with a number of consequent symptoms; but, such effects commonly diminish, on the patient becoming a little accustomed to the medicine. Mercury often produces pains like those of rheumatism, and nodes of a scrophulous nature. (*Hunter, p.* 339, 340.)

The quantity of mercury to be thrown into the constitution, for the cure of any venereal complaint, must be proportioned to the violence of the disease. However, we are to be guided by two circumstances, namely, the time, in which any given quantity is to be thrown in, and the effects it has on some parts of the body, as the salivary glands, skin, or intestines. For, mercury may be thrown into the same constitution in very different quantities, so as to produce the same ultimate effect; but, the two very different quantities must also be in different times; for instance, one ounce of mercurial ointment, used in two days, will have more effect upon the constitution, than two ounces used in ten. The effects of one ounce, used in two days, on the constitution and diseased parts, are considerable. A small quantity, used quickly, will have equal effects, to those of a large one employed slowly; but, if these effects are principally local, that is, upon the glands of the mouth, the constitution at large not being equally stimulated, the effect upon the diseased parts must be less, which may be known by the local disease not giving way in proportion to the effects of mercury on some particular part. If it is given in very small quantities, and increased gradually, so as to steal insensibly on the constitution, a vast quantity at a time may at length be used, without any visible effect at all. (*Hunter, p.* 341.)

These circumstances being known, mercury becomes a much more efficacious, manageable, and safe medicine, than it was formerly thought to be; but, unluckily, its visible effects upon the mouth and the intestines are sometimes much more violent, than its general effect upon the constitution at large. These parts must therefore not be stimulated so quickly, as to hinder the necessary quantity of mercury from being used.

The constitution, or parts, are more susceptible of mercury at first, than afterwards. If the mouth is made sore, and allowed to recover, a much greater quantity may be thrown in, a second time, before the same soreness is produced. However, anomalous cases occur, in which, from unknown causes, mercury cannot at one time be made to produce any visible effects; but, afterwards, the mouth and intestines are all at once affected. (*Hunter, p.* 342.)

Mercury occasionally attacks the bowels, and causes violent purging, even of blood. This effect is remedied by intermitting the use of the medicine, and exhibiting opium. At other times, it is suddenly determined to the mouth, and produces inflammation, ulceration, and an excessive flow of saliva. To obtain relief in this circumstance, purgatives, nitre, sulphur, gum-arabic, lime-water, camphor, bark, kali sulphuratum, blisters, &c. have been advised. Mr. Pearson, however, does not seem to place much confidence in the efficacy of such means, and, the mercury being discontinued for a time, he recommends the patient to be freely exposed to a dry cold air, with the occasional use of cathartics, peruvian bark, and mineral acids, and the assiduous application of astringent gargles. "The most material objection, (says Mr. Pearson,) which I foresee against the method of treatment I have recommended, is the hazard, to which the patient will be exposed, of having the saliva suddenly checked, and of suffering some other disease in consequence of it.

"That the hasty suppression of a ptyalism may be followed by serious inconveniences, has been proved by Dr. Silvester, (*Med. Obs. and Inq. Vol.* 3.) who published three cases of persons, who had been under his own care; two of whom were afflicted with violent pains; and the third scarcely retained any food in her stomach for the space of three months. I have seen not only pains, but even general convulsions produced from the same cause. But, this singular kind of metastasis of the mercurial irritation does not appear to me to owe its appearance to simple exposure to cold and dry air; because, I have known it occur in different forms, where patients continued to breathe a warm atmosphere, but used a bath, the water of which was not sufficiently heated. Cold liquids, taken in a large quantity into the stomach, or exposure of the body to cold and moisture, will also prove extremely injurious to those, who are fully under the influence of mercury; whereas breathing a cool air, while the body is properly covered with apparel, has certainly no tendency to produce any distressing, or dangerous consequences.

"If, however, a suppression of the ptyalism should be occasioned by any act of indiscretion, the remedy is easy and certain; it consists only in the quick introduction of mercury into the body, so as to produce a soreness of the gums, with the occasional use of a hot bath." (*Pearson on the Effect of various Articles in the Cure of Lues Venerea, Edit.* 2, *p.* 163, 164.)

Mercury, when it falls on the mouth, produces, in many constitutions, violent inflammation, which sometimes terminates in mortification. In these habits, great caution is necessary. The ordinary operation of mercury does not permanently injure the constitution; but, occasionally, the impairment is very material; mercury may even produce local disease, and retard the cure of chancres, buboes, and certain effects of the lues venerea, after the poison has been destroyed. (*Hunter, p.* 342.)

From mercury occasionally acting on the system, as a poison, quite unconnected with its agency as a remedy, and neither proportionate to the inflammation of the mouth, nor the actual quantity of the mineral absorbed, Mr. Pearson noticed that one, or two patients in general died suddenly every year in the Lock Hospital. The morbid state of the system, which tends to the fatal event, during a mercurial course, is named by Mr. Pearson *erethismus*, and is characterized by great depression of strength, a sense of anxiety about the præcordia, irregular action of the heart, frequent sighing, trembling, a small, quick, and sometimes an intermitting pulse, occasional vomiting, a pale contracted countenance, a sense of coldness; but the tongue is seldom furred, and neither the vital, nor natural functions are much disordered. They, who die suddenly of the mercurial erethismus, have frequently been making some little exertion just before. To prevent the dangerous consequences of this state of the system, the use of mercury must be discontinued, whatever may be the stage, extent, or violence of the venereal symptoms. The patient should be directed to expose himself freely to a dry and cool air, in such a manner, as shall be attended with the least fatigue, and he should have a generous diet. In this manner, patients often recover sufficiently in ten, or fourteen days, to resume the use of mercury with safety. In the early stage, the mercurial erethismus may often be averted by leaving off the mercury, and giving the mistura camphorata with large doses of the volatile alkali. When the stomach is unaffected, sarsaparilla sometimes does good. (*Pearson, p.* 154, *&c.*)

Occasionally, the use of mercury brings on a peculiar eruption, which has received the several names of *hydrargyria, mercurial rash, eczema mercuriale, lepra mercurialis, mercurial disease*, and *erythema mercuriale*.

"Eruptions of various kinds are very common symptoms of syphilis, but a very unusual effect of mercury. Therefore, until the real nature of this erythema was lately discovered, whenever it occurred in patients undergoing a mercurial course for syphilitic complaints, it was naturally enough considered, as an anomalous form of lues venerea. The mercury was consequently pushed to a greater extent, in proportion to the violence of the symptoms, and, from the cause of the disease being thus unconsciously applied for its removal, it could not fail to be aggravated, and hurried on to a fatal termination. The observation of this fact, conjoined with another, of less frequent occurrence, namely, that a similar eruption did sometimes appear in patients using mercury for other complaints, and in whom no suspicion of syphilis could be entertained, at last led some judicious practitioners in Dublin to the important discovery, that the eruption was entirely an effect of mercury, and not at all connected with the original disease. This discovery was not published till 1804." (*M'Mullin, in Edinburgh Medical and Surgical Journal, No.* 5.) Mr. Pearson states, however, that he has been acquainted with the disease ever since 1781, and has always described its history and treatment in his lectures, since 1783.

The eruption is attended with more or less indisposition, is not confined to either sex, or any particular constitution, and seems to be equally produced by mercury applied externally, and by any of its preparations taken inwardly. Mr. Pearson has never seen it in subjects above 50; and he says, its occurrence is more common about eight, or ten days after beginning a mercurial course. (*P.* 166.)

Dr. M'Mullin has described three distinct stages of the erythema mercuriale. "The first stage commences with languor, lassitude, and cold shiverings; these symptoms are succeeded by increased temperature of the body, quick pulse, nausea, headach, and thirst. The patient is troubled with a dry cough, and complains of difficult respiration, anxiety, and sense of stricture about the præcordia. The tongue is usually moist, and covered with a white glutinous slime: it sometimes appears clean, and brightly red in the centre, whilst the margins remain foul. The skin feels unusually hot and itchy, with a sense of prickling, not unlike the sensation experienced from the application of nettles. The belly is generally costive; but, a diarrhœa is often produced by very slight causes.

"On the first, or second day, an eruption most commonly shews itself, the colour of which is either dark or bright red: the papulæ are at first distinct and elevated, resembling very much those in rubeola. Sometimes, but rarely, the eruption appears like urticaria, and in such instances the disease is observed to be very mild. The papulæ very speedily run together in such a manner as to form a suffused redness, which disappears on pressure. In most cases, it begins first on the scrotum, inside of the thighs, fore-arm, or where mercurial friction had been applied, and the integuments of the parts affected become much swoln. There have also been observed instances, where an eruption of a purplish colour, and unaccompanied by papulæ, has diffused itself suddenly over the entire body. This, however, may be considered as uncommon. In every instance, which came under my observation, it was confined at first to a few places, and from thence gradually extended, until the different portions of the eruption had united, and the papulæ were also rough to the feel. But in those cases, which resemble urticaria, a number of minute vesicles, which contain a serous fluid, appear, from the commencement, interspersed among the papulæ. Contrary to what happens in most diseases accompanied with cutaneous affections, the febrile symptoms are much aggravated, and continue to increase after the eruption has been completed. The pulse in general beats from 120 to 130 in a minute, the thirst continues urgent, and the patient, extremely restless, seldom enjoys quiet sleep. When the eruption has continued in this manner for a certain period, the cuticle begins to peel off in thin, whitish, scurfy exfoliations, not unlike those observed in rubeola. This desquamation has not been attended to by Dr. Moriarty or Mr. Alley, if they have not, by giving the same name to the decrustation which occurs in the last stage, confounded both together. It commences in those places where the eruption first made its appearance, and in this order spreads to other parts. About this period the fauces become sore, the tongue swells, and the eyes appear somewhat inflamed.

"The duration of this stage is very various; sometimes it continues from ten to fourteen days, and, in other cases, it terminates in half that time. When the disease has appeared in its mildest form, the patient recovers immediately after the desquamation, a new cuticle having formed underneath; but, if severe, he has only experienced the smallest part of his sufferings, and the skin now assumes a new appearance, which I have considered as the second stage.

"The skin at this period appears as if studded with innumerable minute vesicles, which are filled with a pellucid fluid. These vesicles may be expected, if the patient, at the close of the first stage, complains of increased itching, and sense of burning heat, in those parts from which the cuticular exfoliations have fallen. They remain sometimes for a day or two, but are most commonly burst, immediately after their formation, by the patient rubbing them, in order to relieve the troublesome itchiness with which these parts are affected. They discharge a serous, acrimonious fluid, which possesses such a very disagreeable odour as to induce nausea in the patient himself, and those who approach near his bed-side. The odour is so peculiar, that it can easily be recognised by any person who has once experienced it.

"This fluid is poured out most copiously from the scrotum, groin, inside of the thighs, or wherever the skin forms folds, and sebaceous glands are most numerous. The serous discharge from these minute vesicles forms, with the cuticle, an incrustation, which may be considered as the third or last stage.

"These crusts are generally very large, and, when detached, retain the figure of the parts from which they have fallen. Their colour is yellowish; but sometimes appears dark and dirty. This period of the disease might be termed I think with much propriety, the stage of *decrustation*, in order to distinguish it more fully from the *desquamation*, which has been already noticed. From the use of the two last terms indiscriminately, those who have described the disease, have introduced into their descriptions a degree of confusion which has caused its progress not to be well understood. When this stage appears, the fauces become more affected, the eyes intolerant of light, and the tarsi tender, inflamed, and sometimes inverted. The crusts formed on the face, as in other parts of the body, before falling off, divide asunder, so as to leave cracks and fissures, which produce an hideous expression of countenance; and the eyelids are also, from the general swelling of the face, completely closed. The back and hairy scalp are last affected, and, even in very severe cases, these parts are sometimes observed to escape entirely. The patient, whilst in this state, is compelled to desist from every kind of motion, on account of the pain which he experiences on the slightest exertion, and which he describes as if his flesh were cracking. The crusts also fall off in such abundance, that the bed appears as if strewed with the cones of hops. Whilst the eruption is only making its appearance in one place, another part may have arrived at its most advanced form; so that all the different stages of the disease may be present at one time in the same individual. It is attended with typhus through its entire course; but it is very curious to observe, that the appetite for food, in most cases, remains unimpaired, and sometimes is even voracious. This circumstance was particularly remarkable in a patient who laboured under the disease, in its worst form, for the space of three months, in the Royal Infirmary of Edinburgh; for double the usual hospital allowance of food was scarcely sufficient to satisfy his hunger. When the catarrhal symptoms have continued during the progress of the complaint, they are, at this advanced period, particularly aggravated: the anxiety and pain of the breast are also very severe, attended with cough, and bloody expectoration, and the patient always feels languid and dejected. The pulse becomes frequent, feeble, and irregular, the tongue black and parched, and at length diarrhœa, delirium, convulsions, gangrene of the surface of the body, and death, supervene. In its mild form, it only goes through the first stage, and terminates, as we have already stated, in a few days, by a slight desquamation. But, when severe, it is often protracted more than two months, every stage of the eruption continuing proportionably longer; and when, in this manner, it has run its course, it repeatedly breaks out on the new surface, and passes through the same stages." (*M'Mullin in Edinb. Med. and Surg. Journal, No. 5.*)

With respect to the remote cause, this is the employment of mercury. Dr. M'Mullin is inclined to think with Dr. Gregory, that the application of cold to the body, while under the action of mercury, is absolutely necessary, for its production; an opinion strengthened by there always existing catarrhal symptoms. Mr. Pearson, however, thinks cold has no concern in bringing on the complaint.

In the early stage, Mr. Pearson recommends small doses of antimonial powder, with saline draughts, or the ammonia acetata. A gentle purgative should be given every three, or four days, and opium to procure sleep. The latter medicine sometimes does most good, when joined with camphor, or Hoffman's anodyne liquor. Sarsaparilla and bark may be given, when the discharge is no longer ichorous, and the tumefaction has subsided. Vitriolic acid has seemed to give relief. The diet may be light and nutritive, without fermented liquors, however, till the desquamation has somewhat advanced. Frequent use of the warm bath, and often changing the patient's linen and sheets, which soon become stiff and rough with the discharge, afford much benefit. If the warm bath cannot be had, Mr. Pearson advises washing the body very tenderly with warm water-gruel; he also covers parts, from which the cuticle is detached, with a mild cerate, and renews the application twice a day. (*P.* 178.)

Dr. M'Mullin advises the immediate discontinuance of mercury; the removal of the patient from wards, where this mineral is in use; emetics and diaphoretics; but on account of the very irritable state of the bowels, he says antimonials are hardly admissible, and that when purgatives are indicated, only the mildest ones, such as ol. ricini, magnesia vitriolata, &c. ought to be given. He advises mucilaginous draughts with opium for relieving the soreness of the fauces. In the second stage, the cold infusion of bark with aromatics and opium, or, what are more praised, wine, porter, &c. To relieve the ophthalmia tarsi, the unguentum oxidi zinci, and to appease the painful sensation of the skin cracking, the linimentum calcis, which should be liberally applied as soon as crusts appear. See more particulars in Dr. M'Mullin's Essay.

Consult *Essay on a Peculiar Eruptive Disease, arising from the Exhibition of Mercury, by G. Alley, Dublin,* 1804. *A Description of the Mercurial Lepra, by Dr. Moriarty, Dublin,* 1804. *Spens and M'Mul-*

*lin, in Edinburgh Med. and Surgical Journal, No. 1, and 5. Pearson on Lues Venerea, Edit. 2.*

### REMARKS ON THE PARTICULAR MODES OF GIVING MERCURY, AND ON ITS PREPARATIONS.

#### *Frictions with Mercurial Ointment.*

No metal acts in its pure metallic state; it must first be more or less combined with oxygen. The mercury, contained in the unguentum hydrargyri, becomes in a certain degree oxydated, when triturated for the purpose of blending it with the fat. The metal, however, in mercurial ointment, is in the most simple, and least combined form, of all its preparations, and hence, it not only generally operates with more mildness on the system, but, with more specific effect on the disease. Various salts of mercury, when given internally, operate more quickly, than mercurial frictions; but, few practitioners of the present day confide solely in any internal preparations for curing the venereal disease, particularly, when the virus has produced effects in consequence of absorption. We shall only just mention in this part of the work, that rubbing in mercurial ointment is the mode of affecting the system with mercury, which is generally considered to agree best with most constitutions, and to act with most certainty on the venereal disease.

#### *Mercurial Fumigations.*

We have mentioned this method, as being one of the most ancient plans of affecting the constitution with mercury, and Lalonette and Abernethy have stated circumstances in its favour, which certainly render it sometimes a very eligible mode. The latter is of opinion, that if the peculiar advantages of mercurial fumigations were generally known to practitioners, they would be much more frequently employed. The advantages of the method consist in its affecting the constitution, when other means have failed, and in producing its effects in a much shorter time, than any other mode requires. How desirable this celerity of operation must often be, when venereal ulceration is making great ravages in the palate, throat, &c. it is needless to insist upon. In patients, who have not strength to rub in ointment, and whose bowels will not bear the internal exhibition of mercury, the mode of fumigation may prove of great service.

"In the year 1776, the Chevalier Lalonette, a physician at Paris, laid before the public an account of a new mode of mercurial fumigation, free from the inconveniences of former ones, and which, in the space of thirty-five years, he had successfully employed in more than four hundred cases, that had resisted all the ordinary methods of cure. His method consisted in inclosing the patient, previously undressed, in a kind of box resembling a sedan-chair, with an opening at the top to let out the head, and another at the bottom, to which was fitted a small grate or furnace, having in it a heated iron for converting the mercurial remedy into fume. The preparation he made use of was a kind of calomel, which, by repeated sublimation from iron-filings, was so far deprived of its muriatic acid, as to be in part reduced into running quicksilver; and, while it possessed considerable volatility, was perfectly unirritating. Some of this powder, being strewed upon the hot iron placed below, was immediately converted into smoke, which surrounded the patient's body, and after some time settled on his skin in the form of a white and very fine calx of quicksilver: a complete dress, having its inner surface fumigated with the same powder, was then put on.—The remedy being thus generally applied to the mouths of the cutaneous absorbents, soon got admission into the circulating fluids, and the constitution became thereby more speedily affected, than by any other process known before." (*Abernethy's Surgical and Physiological Essays, Part* 3.)

As the fumigating powder used by M. Lalonette was very operose, and consequently a very expensive preparation, and appeared to have no advantages over one made by abstracting the muriatic acid from calomel by means of volatile alkali, Mr. Abernethy has always employed the latter, which is prepared at the hospital in the following manner: Two drachms of aqua ammoniæ are added to six ounces of distilled water, and four ounces of calomel are thrown into this liquor, and shaken up with it; the powder is afterwards separated by a filter, and dried.

The powder thus obtained is of a grey colour, and contains a good deal of quicksilver in its metallic state, which of course is extremely volatile, but becomes oxydated when raised into fume, and afterwards condensed into a white subtile powder.

Mr. Abernethy never knew this method fail in curing the lues venerea.

In local disease of the joints, such, for instance, as frequently takes place in the knee, and in sarcomatous enlargements of the breast in women, the late Mr. Sharp, and Sir C. Blicke were accustomed to direct fumigated stockings, or under-waistcoats, to be worn; by which these complaints were relieved, and the constitutions of the patients affected, without the trouble and unpleasantness arising from the use of the common mercurial ointment. (See *Abernethy's Surgical and Physiological Essays, Part* 3.)

Mr. Pearson procured Lalonette's machine, and made a considerable number of experiments to determine the comparative advantages of this method, and mercurial frictions. He found, that the gums became turgid and tender very quickly, and that the local appearances were sooner removed, than by the other modes of introducing mercury into the system; but that it soon brought on debility, a rapid and premature salivation, and, of course, the medicine could not be steadily continued. This gentleman concludes, that where checking the progress of the disease suddenly is an object of great moment, where the body is covered with venereal ulcers, or where the eruptions are large and numerous, so that there scarcely remains a surface large enough to absorb the ointment, the vapour of mercury will be advantageous. But, he thinks it extremely difficult thus to introduce a sufficient quantity of mercury into the system to secure the patient from a relapse, and therefore the plan by no means eligible as a general practice. The vapour of mercury, he says, is singularly efficacious, when applied to venereal ulcers, fungi, and excrescences; but this plan requires an equal quantity of mercury to be given in other ways, as if the local application itself were not a mercurial one. (*Pearson on Lues Venerea, p.* 145, *&c.*)

For the purpose of fumigating sores, the hydrargyrus sulphuratus ruber is commonly used. Ulcers and excrescences about the pudendum and anus in women are said to be particularly benefited in this way; and in these cases the fumes are most conveniently applied by placing a red-hot heater at the bottom of a night-stool pan, and after sprinkling on it a few grains of the red sulphurated quicksilver, placing the patient on the stool. On other occasions, a small apparatus, sold at the shops, is used, which enables the surgeon to direct the fumes through a funnel against the ulcer in any situation.

Though mention has just been made of *venereal* excrescences, I am of opinion with Mr. Abernethy, that it is very questionable, whether any are ever really of this nature. I know, that many excrescences and verrucæ about the anus, and parts of generation, diminish and are cured by a course of mercury. This is the only argument in favour of their being venereal; for, when tied, cut off, or made to fall off by stimulating them with pulv. sabinæ and ærugo æris, they are as effectually cured, as if mercury had been given. In the military hospital at Cambray, I had under my care last year a man, on whose scrotum there were several warty excrescences, some of which were as large as a shilling. Mr. Booty, assistant staff surgeon, prescribed mercury, by which they were certainly cured with surprising expedition. In this particular case, I think the plan of treatment adopted was the best, because, on account of the number of excrescences, and the situation of some of them at the lower and back part of the scrotum, it would have been difficult to have treated them altogether by local applications.

### PREPARATIONS OF MERCURY FOR INTERNAL EXHIBITION.

The acetite of mercury is supposed to be a mild preparation, and was the active ingredient in the celebrated Keyser's pills. In solution it has also been recommended to be applied externally for the removal of some cutaneous affections. It may be made into pills with crumb of bread. The dose is from one to five grains every night.

When you wish to excite a salivation quickly, when mercurial ointment alone will not produce this effect, or cannot be employed, and when fumigating is not convenient nor agreeable, the hydrargyrus calcinatus is often prescribed. The common dose is a grain, which may be increased to two, a day. It is apt, however, to disagree with the stomachs and bowels of many patients; but, some can still continue to take it when conjoined with opium.

The hydrargyrus cum creta has occasionally been prescribed. The dose is ten grains; but it is a preparation, at present, not in much repute.

The hydrargyrus muriatus (corrosive sublimate) was a medicine highly praised for its antisyphilitic virtues by the celebrated Van Swieten, and, indeed, there is no doubt, that, like other preparations of mercury, it possesses such qualities. It retains great reputation even now, and, probably, will always do so. However, like the hydrargyrus calcinatus, it sometimes deranges the stomach and bowels, and is never deserving of such confidence as mercurial frictions. Mr. Pearson remarks, that "when the sublimate is given to cure the primary symptoms of syphilis, it will sometimes succeed; more especially when it produces a considerable degree of soreness of the gums, and the common specific effects of mercury in the animal system. But it will often fail of removing even a recent chancre; and where that symptom has vanished during the administration of corrosive sublimate, I have known a three months course of that medicine fail of securing the patient from a constitutional affection. The result of my observations is, that simple mercury, calomel or calcined mercury, are preparations more to be confided in, for the cure of primary symptoms, than corrosive sublimate. The latter will often check the progress of secondary symptoms very conveniently; and I think it is peculiarly efficacious in relieving venereal pains, in healing ulcers of the throat, and in promoting the desquamation of eruptions. Yet, even in these cases, it never confers permanent benefit; for, new symptoms will appear during the use of it; and, on many occasions, it will fail of affording the least advantage to the patient, from first to last. I do sometimes, indeed, employ this preparation in venereal cases; but it is either at the beginning of a mercurial course, to bring the constitution under the influence of mercury at an early period, or during a course of inunction, with the intention of increasing the action of simple mercury. I sometimes, also, prescribe it after the conclusion of a course of frictions, to support the mercurial influence in the habit, in order to guard against the danger of a relapse. But, on no occasion whatever, do I think it safe to confide in this preparation singly and uncombined, for the cure of any truly venereal symptom." (*Pearson on Lues Venerea.*)

The dose of hydrargyrus muriatus is a quarter of a grain.

The following is a common mode of ordering it: ℞. Hydrargyri Muriati gr. i. Aquæ Nucis Moschatæ ℥ij. Misce. ℥ss. Omni nocte sumenda.

The hydrargyrus muriatus mitis (calomel) is not much used by modern surgeons for the cure of the venereal disease. Sometimes, indeed, it is given in cases of gonorrhœa, with a view of preventing venereal symptoms from following. But, it is extensively given as an alterative, and for the cure of such surgical diseases as require the system to be slightly under the influence of mercury. It generally proves actively purgative, when more than two or three grains are given.

The hydrargyrus phosphoratus has been successfully prescribed in the following formula: ℞. Hydrargyri phosphorati gr. iv. Corticis Cinnamomi in pulverem triti gr. xiv. Sacchari Purif. ʒss. Misce.

The whole is to be divided into eight equal parts, one of which is to be taken every morning and evening, unless salivation takes place, when it ought to be discontinued. Some patients, however, will bear from one to two grains of the phosphat of quicksilver, without inconvenience.

"This remedy has been observed to heal inveterate venereal ulcers in a very short time, nay, in the course of a few days, particularly those about the pudenda. In venereal inflammations of the eyes, chancres, rheumatisms, and chronic eruptions, it has proved of eminent service. Upon the whole, if used with the necessary precaution, and in the hands of a judicious practitioner, it is a medicine mild and gentle in its operation. The cases, in which it deserves the preference over other mercurial preparations, are these: in an inveterate stage of syphilis, particularly in persons of torpid insensible fibres—in cases of exostosis as well as obstructions in the lymphatic system—in chronic complaints of the skin, &c." (*Journ. de Gotha.*)

In the Pharmacopœia Chirurgica may be seen an account of the manner of making the hydrargyrus phosphoratus, taken from the Journal of Inventions of Gotha, No. 2. As the author of the first work suggests, opium would certainly be most likely to correct the bad effects of the preparation on the stomach and bowels.

It is generally admitted by surgeons, that the most simple preparations of mercury are the most effectual in eradicating the venereal disease. The pilulæ hydrargyri are the most simple of the internal formulæ, being merely mercury triturated with mucilaginous or saccharine substances. Next to mercurial frictions, they are, perhaps, most frequently employed for the cure of the incipient form of the venereal disease, that is, while a chancre is the only complaint. They are also very commonly given in all stages of the disease, to aid mercurial frictions in bringing the system under the influence of the specific remedy. Ten grains of the mass, kept for these pills, is the usual dose. When they purge, opium will sometimes prevent this effect.

We must reserve other observations on the use of mercury in syphilis for the article *Venereal Disease.*

Mercury is employed both constitutionally and locally in numerous surgical cases; for the removal of indolent thickenings and indurations of parts; for the relief of tinea capitis, herpetic diseases, tetanus, hydrophobia, hydrops articuli, and a multitude of other affections, which we need not here specify.

**MEROCELE.** (from μερος, the thigh, and κηλη, a tumour.) A femoral or crural hernia. See *Hernia.*

**MEZEREON.** (said, by Blanchard, to be derived from some barbarous dialect.) This medicine was recommended by Dr. A. Russell for a particular class of venereal symptoms, in the following terms: "The disease, for which I principally recommend the decoction of the mezereon root as a cure, is the venereal node that proceeds from a thickening of the membrane of the bones. In a thickening of the periosteum, from other causes, I have seen very good effects from it: and it is frequently of service in the removal of those nocturnal pains, with which venereal patients are afflicted;

though, in this last case, excepting with regard to the pain that is occasioned by the node, I own I have not found its effects so certain, as I at first thought I had reason to believe. I do not find it of service in the cure of any other symptom of the venereal disease." (*Med. Obs. and Inq. vol.* 3, *p.* 194, 195.) Mr. Pearson, however, asserts, unequivocally, that mezereon has not the power of curing the venereal disease in any one stage, or under any one form, and if the decoction should ever reduce a venereal node, yet there will be a necessity for taking mercury in as large quantity, and for as long a time, as if no mezereon had been exhibited. Cullen found this medicine of use in some cutaneous affections, but, excepting an instance or two of lepra, Mr. Pearson has very seldom found it possessed of medicinal virtue, either in syphilis, or the sequelæ of that disease, scrofula, or cutaneous affections. (*Pearson on Lues Venerea, p.* 55—59.)

**MODIOLUS.** The crown, or saw of a trepan.

**MOLLITIES OSSIUM.** A morbid softness of the bones, which become preternaturally flexible, in consequence either of the inordinate absorption of the phosphate of lime, from which their natural solidity is derived, or else of this matter not being duly secreted and deposited in their fabric. In rickets, the bones only yield and become distorted by slow degrees, and retain their natural inflexibility; but, in the present disease, they may be at once bent in any direction. The mollities ossium is an exceedingly uncommon disease, and its causes are buried in obscurity. Surgical writers have usually considered mollities and fragilitas ossium, as two distinct and different affections. Boyer thinks, however, that this point is by no means well established. He admits, that there have been a few rare instances of mollities, where the bones were completely flexible, without any degree of fragility. But, he contends, that in almost all the cases on record, the fragilitas and mollities have been combined. He regrets, that bones, affected with fragility, have never been chemically, nor anatomically examined, particularly, as there have been persons, who while living merely betrayed the symptoms of mollities ossium, yet, in whom unsuspected fractures, evidently of long standing, were discovered after death; while other fractures also happened from the slightest causes during the examination of the same bodies. (See *Boyer's Traité des Maladies Chir. T.* 3, *p.* 607—609.) In the present place, I shall merely describe the pure mollities ossium, or that disorder of the bones, in which they become completely flexible, and lose all their natural firmness. And in order to give an idea of the disorder, I shall quote the case of Madame Supiot. In the year 1747 she had a fall, which occasioned her to keep her bed for some time, and left great pain and weakness in her loins, and lower extremities. In about a year and a half afterwards, she began to perceive her left leg particularly affected. Along with this weakness, she had violent pains over her whole body, which increased after a miscarriage, and still more after a natural delivery, in the year 1751. She was now seized with startings, great inquietude, and such violent heats, that she was almost continually in a sweat, and could not bear the least covering even in the coldest weather, and while her pains continually increased, she took notice that her urine precipitated a white sediment. Her pains abated on the appearance of the sediment, but she now observed that her limbs began to bend, and from this time the softness of them gradually increased till her death. In the month of April 1752, the trunk of the body did not exceed 23 inches in length; the thorax exceedingly ill formed, and the bones of the upper part very much distorted; those of the lower part were very much bent, and the thigh-bones became so pliable, that her feet might easily be laid on each side of her head. The right side did not, till after some time, become so deformed as the left; but it was surprising to observe the alterations which daily took place, and the different figures assumed by the limbs, in consequence of the increased softness of the bones; so that when the sediment in the urine was considerable, the disease of the bones seemed to be at a stand, increasing considerably when it was suppressed. Besides this, she had violent pains, startings, difficulty of breathing, spitting of blood, and, lastly, a fever, with convulsions. She died in the beginning of November 1752, and, on dissecting her body, the following appearances were observed: 1. The muscles in general were of a very soft and pale consistence, the vastus externus, fascialis, quadriceps, biceps, and external parts of the gracilis, were much shorter than in their natural state, and more firm and tense; while those on the opposite side were much elongated, thin, and very tender; in short, the whole muscular system had suffered more or less, according to the action of the muscles in her life-time. 2. The bones were entirely dissolved, the periosteum remaining unhurt, so that they exhibited only the form of a cylinder. 3. The heart and large blood-vessels, both veins and arteries, contained large black polypi, of a viscid consistence, and very unlike those usually found in dead bodies.

A case of softness of the bones is related by Mr. Gooch, but considerably different from the above, as it was attended with a remarkable fragility of the bones before they became soft. It likewise began with pains through the whole body, attended with feverish symptoms; but, after some weeks, these pains were confined chiefly to the legs and thighs, and they were not increased by pressure. This fragility of the bones does not appear to have been the case with Madame Supiot. In the month of June 1749, Mr. Gooch's patient broke her leg, in walking from her bed to a chair, and heard the bone snap. No callus, however, formed, though the fracture was instantly reduced, and treated by one of the best surgeons in her part of the country; but, instead of this, the bones began to grow flexible, and, in a few months, were so from the knee to the ankle. The disease still continued to increase, so that, in a short time, the other leg and thigh were affected in the same manner, after which both legs and thighs became œdematous, liable to excoriations, and to discharge a thin yellow ichor. Scorbutic symptoms began to appear in the winter after her leg was broken, and her gums began to bleed. Tonic medicines were exhibited without any success, except that her menstruation became more regular, and her appetite and digestion better than before; but, towards the end of her life, her breathing became difficult, the spine distorted, and a pain in the loins took place upon every motion of the vertebræ: and, as her limbs were now quite useless, she was obliged to sit upright in bed. At last, the ends of the bones, on which she sat, having become also very soft, spread much, and the ends of her fingers and thumbs, by frequent endeavours to raise herself, became also very broad, and the phalanges crooked. The flexibility of the bones gradually increased, and became more general, attended with a wasting of the flesh, and excessive difficulty of breathing. The menstrual flux totally ceased four months before her death; her legs, which were very anasarcous, and excoriated almost all over, became erysipelatous; but, she retained her senses to the last. She expired suddenly, having talked in a composed manner concerning her miserable situation and approaching end only a few moments before.

On examining the body, she was found to have lost two feet two inches of her natural stature. The heart and lungs appeared sound, but had been much confined, principally by the liver, which was enlarged to an extraordinary degree; it was not, however, scirrhous, nor in any other way diseased. The spleen was very small, and the mesentery had one large scirrhous gland. All the bones, except the teeth, were softened, so that scarcely any of them could resist the knife; but those of the lower extremities were the most dissolved, being changed into a kind of parenchymous substance, like soft dark-coloured liver, without any offensive smell. So completely, indeed, were they decomposed, that the knife met with less resistance in cutting through them, than in sound muscular flesh, though some bony lamellæ were here and there to be met with, but as thin as an egg-shell. The most compact bones, and those which contained the greatest quantity of marrow, were the most dissolved; and it was observable, that the dissolution began internally, for the bony laminæ remained here and there on the outside, and nowhere else. The periosteum was rather thicker, than ordinary, and the cartilages thinner; but, not in a state of dissolution. The bones were found to contain a great quantity of oily matter and little earth. No cause could be assigned for the disease; and in the case of Madame Supiot, the one assigned, viz. that of her eating too much salt, seems totally inadequate to explain the origin of the disorder. All the cases of the mollities ossium on record have proved fatal, and no means of cure are yet known.

For additional observations, connected with this subject, refer to *Fragilitas Ossium* and *Rickets.* Boyer and Richerand, treat of the mollities ossium, and rickets, indeed, as one and the same disease; but, at all events, the preceding cases are exceptions to the accuracy of such doctrine.—*Morand in Mem. de l'Acad. des Sciences,* 1752. *See also T. Lambert, Relation de la Maladie de Bernard d'Armagnac, sur un ramolissement des Os. Toulouse* 1700. *Fernelius, in lib. de abditis rerum causis. Th. Bartholinus, Hist. Anat. Cent.* 4. *Petit, Histoire de l'Acad. des Sciences,* 1722. *Hoin, ibid.* 1764. *Gagliardi, Anatomes Ossium. Romæ,* 1689. *Fries, Dissert. de Emollitione Ossium. Argentor.* 1775. *Thompson, in Med. Observations and Inquiries, Vol.* 5, *p.* 259. *C. C. Siebold, Würzbürger gelerthe anzeigen, Beilage zum* xix *stück für das jahr* 1791. *Chirurgical Observations and Cases, by William Bromfield, Vol.* 2, *p.* 30, *&c. Boyer's Traité des Maladies Chirurgicales, T.* 3, *p.* 607, *&c. Paris* 1814. *Richerand's Nosographie Chir. T.* 3, *p.* 142. *What these two writers say, however, chiefly relates to rickets. We meet with cases of Mollities Ossium in the Philosophical Transactions; Act. Afniens.; German Ephem.; Saviard's Obs. Chir.; the writings of Forestus; Gooch's Chirurgical Works, Vol.* 2, *p.* 393—399. *Edit.* 1792; *&c.*

**MONOCULUS.** (from *μονος*, single. and *oculus*, the eye.) A bandage formerly applied to the fistula lachrymalis, and diseases of the eye. It consists of a single-headed roller three ells long. In order to apply it to the right eye, it is to be held in the right hand, and its end in the left, *et vice versâ.* This end is to be put on the back of the neck, and one turn of the roller is to be carried round, over the forehead, so as to meet the extremity of the bandage. The roller is then to descend under the ear of the side affected, and to pass obliquely over the cheek underneath the eye, and next over the root of the nose, and opposite the parietal bone, to the nape of the neck. The third turn of the roller is to overlap the second a little; the third the fourth; making what the French call *doloires*; and the application of the bandage is completed by making turns round the head. The use of the monoculus was only to retain dressings. (*Encyclopédie Méthodique; Partie Chirurgicale.*)

**MORTIFICATION.** (*mortificatio*, from *mors*, death, and *fio*, to become.) The death of a part of the body.

Mortification is of two kinds; the one, without inflammation; the other, preceded by it. To this last species of mortification, the terms, *inflammatory, humid*, or *acute gangrene*, are often applied; while the second, or that which is not preceded by any or much inflammation, has been distinguished by the epithets, *dry*, or *chronic*, and sometimes *idiopathic*, when no cause for the origin of the disease can be assigned. Inflammation is an increased action of that power, which a part naturally possesses; and in healthy inflammations, at least, it is probably attended with an increase of power. In cases, however, which are to terminate in mortification, there is no increase of power; but, on the contrary, a diminution of it. This, when joined to an increased action, becomes a cause of mortification, by destroying the balance, which ought to subsist between the power and action of every part. There are, besides, cases of mortification, preceded by inflammation, which do not arise wholly from that, as a cause: of this kind, are the carbuncle and the slough formed in the small-pox pustule. (*Hunter.*)

The first general division, therefore, of mortification is into two kinds; first, into the *inflammatory, humid*, or *acute*; and secondly, into the *dry*, or *chronic*. But, the disorder is also subdivided into many species, which are determined by the nature of their particular exciting causes, as we shall presently detail.

When any part of the body loses all motion, sensibility, and natural heat, and becomes of a brown, livid, or black colour, it is said to be affected with *sphacelus*, that is, complete mortification. As long as any sensibility, motion, and warmth, continue, the state of the disorder is termed, *gangrene*. This word is here made use of to signify only a degree of sphacelus, or rather the process, by which any local disorder falls into the state of complete mortification. Many authors use both terms synonymously; but, it is to be observed, that gangrene does not invariably end in sphacelus; nor is the latter always preceded by the former. (*Richter's Anfangsgr. der Wundarzneykunst. Band* 1. *Kap.* 3.) There are some surgical writers, however, who make the distinguishing circumstance of sphacelus to be the extension of the disorder to the bones as well as the soft parts. (*Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 30, *Edit.* 1809.)

This last application of the term sphacelus, however, is at present never made; for, as Mr. Pearson has rightly observed, the distinctions, "which are founded merely upon the parts, that suffer, or upon the profundity, to which the disease has penetrated, seem inadequate and useless." (*Principles of Surgery, p.* 115, *Edit.* 2.) The manner in which Dr. J. Thomson views the subject, may be considered as coinciding with the general sentiments of the best modern surgeons. "I shall employ the term, *gangrene*, (says he) to express that stage of mortification, in inflamed parts, which precedes the death of the part; a stage, in which there is a diminution, but not a total destruction of the powers of life; in which the blood appears to circulate through the larger vessels; in which the nerves retain a portion of their sensibility; and in which, perhaps, the part affected may still be supposed to be capable of recovery. The word, *sphacelus*, I shall use to denote the complete death, or mortification of a part; that state, in which the powers of life have become extinct; in which the blood ceases to circulate; and in which the sensibility of the nerves is lost, whether the dead, or mortified part has, or has not, become actually putrid, or shewn any tendency to separate and fall away from the living and sound parts. Putrefaction, or the spontaneous process, by which animal bodies are decomposed, is an accidental, and not a necessary effect of the state of mortification. It takes place at very different periods, after the death of particular parts; and these periods, it may be remarked, are always regulated, not only by external circumstances, such as the humidity and temperature of the atmosphere, but, also, by the peculiar structure and morbid conditions of the animal texture, or organ, in which the putrefaction occurs. The term, sphacelus, has, I know, been employed to express, that a part is not only completely dead, or mortified, but, also, that that part has become putrid, and is in a state of separation from the surrounding and living parts. But, as putrefaction is not a necessary, or immediate, consequence of mortification, or partial death in animal bodies, this use of the term sphacelus, is obviously improper." (See *Thomson's Lectures on Inflammation, p.* 504.)

The causes of mortification are either

internal, or external. It is commonly taught in the medical schools on the continent, that the internal causes probably operate after the manner of a deleterious substance, which being introduced into the circulation, occasions a putrefaction of the fluids. (*Lassus, op. et loc. cit.*)—Boyer also professes a similar notion. (See *Traité des Maladies Chir. T.* 1. *p.* 140.) This doctrine, however, is supported by no sort of proof, and may be considered as entirely hypothetical, if not decidedly erroneous.

There are, indeed, as the preceding author has noticed, some spontaneous mortifications, the primitive cause of which is not always well understood: an inflammation, apparently slight, may become gangrenous immediately it has made its appearance. In scorbutic, venereal, and small-pox cases, we have daily instances of this fact. Other internal causes, without any very evident pre-existing disease, sometimes destroy persons, by gangrenous mischief, who are but little advanced in years. (*Saviard, Obs.* 16. *Haller, Disput. Chirurg. Tom.* 4, *p.* 551.) Certain poisonous, acrid, caustic substances taken inwardly, or introduced under the skin, may have the same effect, by annihilating the vital action, or destroying the texture of parts. *Lassus Pathologie Chirurgicale, Tom.* 1, *p.* 31.) But, though these observations, may all be entirely correct, they by no means justify the conclusion, that the internal causes of mortification ever act like a deleterious matter producing a putrefaction of the fluids. The mortification of the toes and feet, so well described by Mr. Pott, is supposed to proceed chiefly from unknown internal causes; although, as we shall presently find, this species of mortification is undoubtedly often attended with an ossified state of the arteries of the limb.

Another very remarkable specimen of mortification from an internal cause, is that originating from eating bread made of bad black wheat, or rye. Besides occurring as an original idiopathic disease, and from obstruction of arteries, chronic, or dry gangrene (observes Dr. Thomson) may be induced by the action of substances taken into the stomach, which seem to produce it as a specific effect in parts remote from the source of the circulation. The most singular example, which we have of this, is in the gangrene produced by the eating of a particular kind of unsound, or diseased rye. This species of mortification has been rarely observed in England; but, it has been frequently seen on the continent, where it has been repeatedly known to prevail in some districts, where rye forms a principal article of food, as an endemial disease. It occurs, however, in such districts only after wet seasons, in which that grain is affected with a particular disease, well known in France by the name of the *Ergot*, or cockspur-rye. In this disease, the grains of rye grow to a large size, acquire a black colour, and have a compact horny consistence. The species of mortification produced by eating this substance, was first particularly described by M. Dodard. (See *Journ. des Savans, an.* 1676.) The part affected became at first insensible and cold, and, in the progress of the disorder, dry, hard, and withered. In very malignant cases, there was delirium. M. Dodard's description of the complaint was very imperfect; but, he has mentioned a circumstance, tending strongly to prove, that the disease actually arose from the alleged cause; viz. that fowls, fed with cockspur-rye, are killed by it. Saviard informs us, that he saw this disease in the year 1694, at the Hôtel-Dieu of Orleans. It attacked the upper and lower extremities, which were rendered, in the course of the disorder, as dry as touch-wood, and as emaciated as Egyptian mummies. In 1710 M. Noel, surgeon to the Hôtel-Dieu at Orleans, transmitted to the Royal Academy of Sciences at Paris an account of this peculiar mortification. About fifty people, men and children, had come that season into his hospital, with the affliction. According to M. Noel, the disorder always began in the toes, and extended itself gradually along the foot and leg, till it sometimes rose to the upper part of the thigh. He had never seen any of the female sex affected with it, and had observed only one instance of it in the upper extremities. The Academy received the history of one case, in which the lower extremities were separated from the body in the articulations of the thigh-bones with the acetabula; the first example, (Dr. Thomson believes) of this separation upon record, and it was the occurrence of this, and of similar cases, that probably first suggested the operation of amputation at the hip-joint. (See *Thomson's Lectures on Inflammation, p.* 541.) As M. Noel's patients did not come under his care, till after the disease had existed some time, he could not describe from his own observation the early symptoms; but, the patients had often told him, that the disease generally began in one, or both feet, with pain, redness, and a sensation of heat, as burning as the fire; and that, at the end of some days, these symptoms ceased, as quickly as they had come on, when the extreme sensation of heat, which they had formerly felt, was changed into cold. The part affected (adds M. Noel) was black, like a piece of charcoal, and as dry, as if it had passed through the fire. After some time, a line of separation was formed between the dead and living parts, like that which appears in the separation of a slough produced by the cautery; and the complete separation of the limb was, in many cases, effected by nature alone. In others, M. Noel was obliged to have recourse to amputation.

This disease appeared in Switzerland in 1709 and 1716, and its symptoms and progress in that country have been accurately described by Langius in a dissertation, entitled, "*Descriptio Morborum ex esu Clavorum Secalinorum.*"

M. Gassoud, physician in Dauphiny, where this disease appeared also in 1709, states, that many of the patients were affected with swellings of the feet and legs, and of the hands and arms, which degenerated into a gangrene, that penetrated to the bone, and produced a separation of the affected limb. The disorder was attended with different symptoms in different individuals. Some suffered very violent pain, accompanied with an insufferable sensation of heat, although the part affected often felt cold to the touch. In other patients redness, with much swelling, supervened, attended with fever and delirium. Other patients were without any fever, or delirium, though they seemed to suffer equal pain. In some patients, the parts affected, became withered, dry, and black, like charcoal. The separation of the dead parts from the living took place with the most excruciating pain, and a sensation, resembling that produced by the direct application of fire. This sensation was sometimes intermittent; and, in other instances, it was succeeded by an equally harassing sensation of cold.

According to M. Bossau, surgeon to the hospital of St. Antoine, in Dauphiny, the cases, which he saw, were not all of the dry kind, the limb sometimes becoming putrid, and maggots being generated. He says, that the disease was not infectious, and it attacked indiscriminately men, women, and children.

The degree of fatality caused by this species of mortification seems to have been extremely various. In the Memoirs of the Royal Academy of Sciences for 1748, M. Duhamel mentions, that of 120 persons afflicted, scarcely four, or five, recovered with their lives. According to Langius, it was equally fatal in Switzerland.

Dr. Thomson believes, that the preceding sort of gangrene, has never occurred in this country, excepting, perhaps, the cases recorded by Dr. Charlton Woolaston, in the Philosophical Transactions for 1762; and which proceeded from eating unsound wheat, not rye. (See *Lectures on Inflammation*, *p.* 548.) For further particulars relating to this curious kind of mortification, I must refer the reader to the valuable work last quoted.

The external causes of mortification, which are manifest, and act mechanically, are, burns; excessive cold; the application of caustics; the presence of any ichorous, urinary, or fecal matter effused in the cellular substance; violent contusions, such as are produced by gunshot wounds, or bad fractures; the strangulation of a part, as in cases of hernia, or when polypi, or other tumours are tied; a high degree of inflammation; and, lastly, every thing, that has the power of stopping the circulation and nervous energy in parts. (*Lassus, Pathologie Chirurgicale, Tom.* 1. *p.* 34, 35.)

Inflammation is one of the most frequent occasional causes of mortification. But, as we have already remarked, the death of a part may take place without any previous inflammatory disorder; and the latter, even when present, has frequently less share in the mischief, than other incidental circumstances, and is, in reality, only an effect of the very same cause, which produces the sphacelus itself. It is oftentimes a matter of doubt, whether actual inflammation precedes the occurrence, or not; for, a part, before it mortifies, is in certain instances only affected with pain, and with no degree of preternatural redness. Lastly, when mortification is, unquestionably, preceded by inflammation, there are so many varieties of the disorder, depending on incidental causes, that these latter demand more attention than the inflammation itself. (*Richter's Anfangsgr. Band* 1, *Kap.* 3.)

Healthy phlegmonous inflammation seldom ends in mortification, though it occasionally does so, when violent and extensive.

Of all the inflammatory complaints, to which the system is liable, erysipelas is observed most frequently to terminate in gangrene, and whenever phlegmon is, in any degree, conjoined with an erysipelatous affection, which it not unfrequently is, it seems thereby to acquire the same tendency, being more difficult to bring to resolution, or suppuration, than the true phlegmon, and more apt to run into a mortified state.

The symptoms of mortification from inflammation take place variously, yet, generally, as follows. The pain and sympathetic fever suddenly diminish, the part affected becomes soft, and of a livid colour, losing, at the same time, more or less, of its natural warmth and sensibility. In some places, the cuticle is detached; while, in other situations, vesicles arise, filled with a clear, or turbid fluid. Such is the state, to which we apply the term, *gangrene*, and, which stage of the disorder too often rapidly advances to *sphacelus*, when the part becomes a cold, black, fibrous, senseless substance, called in technical language a *slough*.

It merits notice, however, that, "in cases, in which gangrene immediately succeeds to inflammation, these two morbid states may, in some measure, be regarded, as stages, or periods, of the same disease. They pass insensibly into one another; nor is it possible to say precisely, where the one state ends, and the other commences. The symptoms of inflammation, in these cases, do not disappear, before those of gangrene come on; but, seem rather to undergo a gradual and almost imperceptible change, or conversion, into one another. *The redness acquires a deeper tinge, and spreads farther*, than formerly; *the swelling increases and becomes more doughy*; and, in this incipient stage, the gangrene, particularly, when it attacks cutaneous texture, often bears a considerable resemblance to erysipelas." (See *Thomson's Lectures on Inflammation, p.* 506.)

It is to be observed, also, that "the part of the body, which becomes affected with gangrene, *does not immediately lose its sensibility;* for, the pain, on the contrary, is often very much aggravated by the approach of this state. *The blood also still continues to circulate*, at least, *in the larger vessels of the part*, but, perhaps, *with less force*; and from the resistance which it meets with in passing through the capillaries, *in less quantity*, than formerly. The serous effusion into the cellular membrane continuing to increase, and the action of the absorbent and sanguiferous vessels to diminish, the part becomes at length incapable of being restored to its former office in the animal economy. It is therefore in its earlier stages only, that gangrene is to be considered as an affection admitting of cure; for, there are limits, beyond which, if it pass, recovery becomes impossible. These limits it may not in every instance be easy to define; but, they form the boundaries between incipient gangrene and the ultimate termination of that state in sphacelus." (*Thomson, op. cit. p.* 507.)

The causes which produce mortification by impeding the return of blood from the part affected, for the most part operate by making pressure on the trunk, or principal branches, of a vein. In these instances, there is always an accumulation of blood in the part, which first swells, becomes of a livid colour, tense, and very painful. Soon afterwards, blisters arise, and the part becomes soft, œdematous, cold, insensible, emphysematous, black, and fetid. Such are the circumstances, which happen in strangulated hernia, in tied polypi, and in a limb, in which the veins have been so compressed by any hard swelling, such as the head of a dislocated bone, as to excite mortification.

Other causes operate by preventing the entrance of arterial blood. The application of a ligature to an artery, as practised in several surgical cases, and all external pressure, that closes the artery, or arteries, on which a part entirely depends for its supply of blood, have this effect. Mortification does not, however, always take place, when the trunk of an artery is rendered impervious, because nature furnishes the necessary supply of blood, through collateral ramifications. But, when the disorder does happen, the part commonly first becomes pale, flaccid, and cold, and soon afterwards shrinks, loses its sensibility, grows black, and perishes.

It is usually represented by writers, that mortification may proceed from a mere lessening of the communication of blood and nervous energy to a part. However, it is to be observed, that parts, deprived of all connexion with the sensorium, by the division, or paralytic state, of their nerves, do not frequently perish on this account. But, as their functions are carried on with less vigour, and their vitality is weakened, the same causes, which sometimes produce mortification in parts differently circumstanced, must much more readily occasion it in these. Among the causes of the present species of mortification, may be mentioned great universal debility; extreme old age; a thickening and ossification of the coats of the arteries, and a consequent diminution of their capacity, and of their muscular and elastic power.

Cowper, the anatomist, was one of the earliest writers, who took notice of this ossification of the arteries of the leg, in persons, who had died of mortification of the feet and toes. (See *Philosoph. Trans. Vol.* 23, *p.* 1195, and *Vol.* 24, *p.* 1970.) A similar case was remarked by Mr. Becket, of which he has given an account in his Chirurgical Observations. The occurrence was also mentioned by Naish. (See *Philosoph. Trans. Vol.* 31, *p.* 226.) Dr. J. Thomson has seen one example of a very complete ossification of the arteries of the leg, accompanying a mortification of the feet and toes. (See *His Lectures on Inflammation, p.* 537.) Speaking of the same subject, Mr. Hodgson remarks: "Experience has proved this condition of the arteries to be at least a constant attendant upon one species of gangrene, to which the extremities of old subjects are liable; and I have found the three principal arteries of the leg nearly obliterated by calcareous matter in two fatal cases of this disease. But, our knowledge of the power of collateral circulation, in every part of the body, will not allow us to admit the obliteration of the trunks as a sufficient cause of mortification, from a deficient supply of blood. It is therefore necessary for us to remember, that the same disease may probably exist in the collateral branches, upon which it has produced similar effects. But, if an extent of vessel be converted into a calcareous cylinder, it loses its elasticity and organic powers, so as to be unable to afford any assistance to the propulsion of the blood; and the existence of parts, supplied by vessels in this state, constitutes a strong argument against the agency of the arteries in the circulation of the blood. The above observations, on the cause of this species of gangrene, at once expose its incurable nature; and this state of the blood-vessels renders the danger of amputation very considerable, unless fortunately the disease in the arteries does not extend to the part, at which the ligature is applied." (See *Hodgson's Treatise on the Diseases of the Arteries and Veins, p.* 41.) However, although the ossified state of an artery must certainly be unfavourable to its healing, it does not constantly prevent this desirable event. (See *Case in Medico-Chir. Trans. Vol.* 6, *p.* 193.)

The preceding facts are particularly entitled to attention, because, as we shall presently find, the opinion that the mortification of the toes and feet arose from an ossification of the arteries, was considered by Mr. Pott as destitute of foundation.

It is probable, however, that sometimes other causes are concerned. Fabricius Hildanus mentions a fatal case of mortification of the feet and legs, where the patient was in the vigor of life, and apparently of good constitution. After death, a scirrhous tumour was found surrounding and compressing the inferior vena cava, and aorta, near their bifurcation, so as to prevent the free circulation of the blood in the lower extremities. Mortification of the extremities also sometimes occurs from deficient circulation, in the progress of diseases of the heart.

The mortification, arising from long continuance in the same posture, is chiefly attributable to the unremitted pressure, which parts sustain, and which obstructs the circulation. Surgeons have frequent occasion to see melancholy examples of this kind of mortification, particularly, in cases of fractures, paralysis from disease of the vertebræ, &c. The mischief most readily occurs, where the bones have the least flesh upon them, and consequently, where all external pressure has the most effect; as, for instance, about the os sacrum, os ilium, spines of the scapulæ, &c. The disordered part always first becomes soft, livid, red at the circumference, and, œdematous, afterwards losing its sensibility, and acquiring a black appearance: at length, it is converted into a foul sloughing ulcer.

Though long continuance in the same posture is the grand cause of this kind of mortification, yet, incidental circumstances are frequently combined with it, and have great influence over the disorder. These are, great debility, the same state of the system, as exists in typhus fever, impure air, unclean bedding, &c.

There are some causes, which produce death in a part at once, by the violence of their operation. A blow, struck very forcibly, on any portion of the body, may destroy the vitality of the fibres and vessels in this sudden manner. Lightning, strong concentrated acids, and gunshot violence, act in this way. When a ball enters the substance of parts with great force and rapidity, it always kills at once many of the fibres, which are in the way of its track, and these must be thrown off in the form of sloughs, before the wound can granulate and heal.

Cold is often another cause of mortification, and, when parts, which have been frozen, or frostbitten, are suddenly warmed, they are particularly apt to slough.

I find in M. Larrey's late valuable publication, some interesting observations on the gangrene from cold. He acquaints us, that after the battle of Eylau, one of the most grievous events, to which the French soldiers were exposed, was the freezing of their feet, toes, noses, and ears: few of the vanguard escaped the affliction. In some, the mortification was confined to the surface of the integuments of the toes, or heels; in some, the skin mortified more deeply, and to a greater or lesser extent; while, in others, the whole of the toes, or foot, was destroyed.

"All the writers on this species of mortification (says M. Larrey) have considered cold as the determining cause; but, if we attend to the period when the complaint begins its progress, and the phenomena, which accompany it, we shall be convinced, that cold is merely the predisposing cause. In fact, during the three or four exceedingly cold days, which preceded the battle of Eylau, (the mercury having then fallen to 10, 11, 12, 13, 14, and 15 degrees below zero of Reaumur's thermometer) and until the second day after the battle, not a soldier had complained of any symptom depending upon the freezing of parts. Nevertheless, we had passed these days, and a great portion of the nights of the 5, 6, 7, 8, and 9th of Feb. in the snow, and the most severe frost. The imperial guard especially, had remained upon watch in the snow, hardly moving at all for more than four and twenty hours, yet, no soldier presented himself at the ambulance,* nor did any one complain of having the feet frozen. In the night of the 9th and 10th of February, the temperature suddenly rose, the mercury ascending to 3, 4, and 5 degrees above zero. A great quantity of sleet, that fell on the morning of the 10th, was the forerunner of the thaw, which took place in the course of that day, and continued in the same degree for several days. From this moment, many soldiers of the guards and the line applied for succour, complaining of acute pain in the feet, and of numbness, heaviness, and prickings in the extremities. The parts were scarcely swollen, and of an obscure red colour. In some cases, a slight redness was perceptible about the base of the toes, and on the back of the foot. In others, the toes were destitute of motion, sensibility, and warmth, being already black and, as it were, dried. All the patients assured me, that they had not experienced any painful sensation during the severe cold, to which they had been exposed on the night-watches of the 5, 6, 7, 8, and 9th of February, and that it was not till the night of the 10th, when the temperature had risen from 18 to 20 degrees, that they felt the first effects of the cold." It is further noticed by M. Larrey, that such patients as had had opportunities of warming themselves in the town, or at the fires of the night-watches, suffered in the greatest degree. (See *Larrey's Mémoires de Chirurgie Militaire, Tom.* 3. *p.* 60—62.)

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* The ambulances of the French army are caravans, furnished with an adequate number of surgeons, and every requisite for the dressing of wounds, and the immediate performance of operations, upon which last circumstance, in particular,

Sometimes mortification seems to depend on epidemic causes. Instances have been known, in which almost all the ulcers and wounds in large hospitals, have become nearly at the same time affected with gangrenous mischief.

The *hospital gangrene*, as it is commonly called, is said to be produced by the putrid effluvia in hospitals, gaols, and ships, where the sick are crowded together in great numbers. "It is (observes Lassus) a true contagion, which is communicated to the wound, or ulcer, by the mere application of linen, or lint, that has been for a certain time in some place, where the air is impregnated with these deleterious miasmata. The impression made on the skin, throat, lungs, and intestinal canal, by such pernicious emanations, occasions gangrenous diseases, which are sometimes epidemic. This affection, the progress of which is so rapid, especially in cold damp weather, and in debilitated subjects, first shews itself locally in the form of greyish ash-coloured spots, like aphthæ, which appear on the surface of the ulcer. Such spots afterwards turn blackish, the vital powers sink, and the ulcer daily enlarges, emitting a most fetid smell." (*Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 37, 38. See also the article *Hospital Gangrene.*

Mortification is very frequently occasioned by the injury, which parts sustain from the application of fire, and heated substances to them. When the heat is very great, the substance of the body is even decomposed, and of course killed at once. On other occasions, when the heat has not been so violent, nor sufficiently long applied, inflammatory symptoms precede the sloughing.

Cutaneous texture is that, in which we have the best opportunity of observing the phenomena and progress of gangrene. When it occurs as a consequence of inflammation, the colour of the skin changes from the florid red to a darker shade; and in the progress of the disease it acquires a livid hue. The cuticle often separates at certain points from the skin, and the vesications, termed *phlyctenæ*, are formed, which usually contain a bloody-coloured serum. As sphacelus comes on, the livid hue disappears, and a slough is formed, which is sometimes ash-coloured; sometimes black. It is not always easy to judge of the extent of mortification from the appearance of the skin; for, when the subjacent cellular membrane is affected, the disorder may occupy a greater extent internally, than upon the surface.

In a spreading gangrene, the red colour of the affected skin is insensibly lost in the surrounding integuments; but, when gangrene, followed by sphacelus, stops, a red line, of a colour more lively than that of gangrene, is generally perceptible between the dead and living parts. It is at the inner edge of this inflamed line, where we usually see the ulcerating process begin, by which the separation of the dead from the living parts is effected. (See *Thomson's Lectures on Inflammation, p.* 511—512.

Mortification occurs frequently in cellular texture. The skin, which covers dead cellular substance, generally has a gangrenous appearance, and afterwards either ulcerates, or sloughs. In some cases, the portion of sphacelated cellular texture, is small, as in the malignant boil; in others, extensive, as in cases of carbuncle. In erysipelas phlegmonoides, the cellular membrane, connecting together the muscles, tendons, nerves, blood-vessels, &c. often perishes to a great extent. Here large portions of skin are frequently also de-

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the life of the wounded soldier often depends. These caravans follow the most rapid movements of the army, and are always capable of keeping up with the vanguard. It is to be regretted, that our army in war-time should be destitute of so valuable an establishment. It is the only means, by which speedy surgical assistance can be rendered to the thousands of wounded in every considerable action.

stroyed by sloughing, or ulceration, so that muscle, blood-vessel, tendon, nerve, &c. are exposed to view, quite denuded of their proper coverings, and in different states of disease.

Artery is the texture, endowed with the greatest power of resisting its own destruction by mortification. "I have (says Dr. Thomson) in various instances of erysipelas phlegmonoides, seen several inches of the femoral artery laid completely bare by the gangrene, ulceration and sphacelus of the parts covering it, without its giving way before death. The arteries in these, and other similar instances, in which I have seen them laid bare in the neck and arm, by abscess terminating in mortification, had the appearance of raw flesh, and were obviously thicker, and more vascular, than natural. The blood circulated through them, and assisted in supplying with nourishment, the parts, upon which they were distributed." (*P.* 513.) I have often seen the truth of the foregoing statement sadly illustrated in cases of sloughing buboes, by which several inches of the femoral artery were exposed. I have seen the throbbing brachial artery denuded for more than a month, nearly its whole extent along the inside of the arm, by the ravages of malignant pseudo-syphilic ulceration, attended with repeated sloughing; and, yet, hemorrhage had no share in carrying off the unfortunate patient.

It is a curious fact, that the blood coagulates in the large arteries, which lead to a mortified part. This occurrence takes place for some distance from the slough, and is the reason, why the separation of a mortified limb is seldom followed by hemorrhage.

The same occurrence also affords an explanation, why, in the amputation of a mortified limb, there is sometimes no hemorrhage from the vessels, although the incisions are made in the living part. This fact was first particularly pointed out by M. Petit, the surgeon. (See *Mém. de l'Acad. des Sciences*, 1732.) "When a gangrened limb (says this celebrated surgeon) is cut off in the dead part, no hemorrhage occurs, because the blood is coagulated a great way in the vessels." He adds: "We have several examples of limbs amputated, on account of gangrene, in which no hemorrhage occurred, although the amputation was made a considerable way in the living parts; because the clot was not confined in these cases to the dead part, but was continued forwards into the living, as far as the inflammatory disposition extended."

According to Dr. Thomson, cases, in confirmation of the foregoing statement, are recorded by other practical writers, especially M. Quesnay, and Mr. O'Halloran. In one of the cases mentioned by the latter gentleman, and in which no hemorrhage followed the removal of the limb, the incisions were made four inches above the division of the dead from the living parts. Dr. Thomson has seen a still longer portion of femoral artery closed up with coagulated blood, after a mortification of the foot and leg; and, in one example, where the mortification began in the thigh, he saw the coagulation of the blood in the external iliac, extending up to the origin of this vessel from the aorta. "So common, indeed, is this coagulation of the blood in the limbs affected with mortification (observes Dr. Thomson), that it has been supposed to be a necessary and constant effect of this disease. This opinion, however, does not appear to be well founded; for, I have now seen several instances, in which a limb has mortified and dropt off, without hemorrhage having occurred from the vessels divided by nature; and, yet, in examining the vessels of the stumps of these patients, after death, I have not been able to find any clots, either of coagulated blood, or of coagulable lymph. In the cases, to which I allude, the adhesive inflammation, occurring in the line of separation between the dead and living parts, had extended to the blood-vessels, and their inner surfaces being inflamed and pressed together by the swelling, which occurs, had adhered so as to close up their extremities. It is in this way, we shall find, that the common ligature acts, which is applied to the divided extremities of arteries and veins; and it is this obliteration, by the process of adhesion, of the extremities of the arteries and veins, in the neighbourhood of the sphacelated parts, that in reality prevents the occurrence of hemorrhage, when the mortified limbs fall off, or are removed by the knife. The coagulation of the blood in the canal of the vessel is not alone sufficient. It may tend, in the cases in which it occurs, for a time to restrain hemorrhage; but, it is by the obliteration by adhesion, of the canal in the extremities of the arteries and veins, that the occurrence of hemorrhage can be securely and permanently provided against. Indeed, to me it seems doubtful, whether that coagulation of blood, which takes place in mortified limbs, ever takes place in the canal of the vessel, till its extremity and lateral communications have been plugged up by the coagulating lymph, which is extended during the state of the adhesive inflammation." (See *Thomson's Lectures on Inflammation*, p. 554.)

When gangrene and sphacelus happen to any extent, the patient is usually troubled with an oppressive hiccough; a symptom well known to the surgeon of experience, and often an indication of the mischief, when external signs are less instructive. The truth of this remark is frequently seen in strangulated herniæ.

The constitution also suffers immediately a considerable dejection. The patient's countenance suddenly assumes a wild, cadaverous look; the pulse becomes small, rapid, and sometimes irregular; cold perspirations come on, and the patient is often affected with diarrhœa and delirium.

As Dr. Thomson observes, the constitutional symptoms "form fevers, which partake in individual cases, more or less, of an inflammatory, typhoid, or bilious character. But, the degree of these fevers varies, in every particular case, from their almost total absence to the highest degree of intensity. The skin is usually hot and dry at the commencement of the attack; the tongue is without moisture, brown, and hard; the pulse is quicker, and less full and strong, than in inflammation; and this state of the pulse is often attended by flattering intermissions, and a considerable degree of subsultus tendinum. The fever has, in general, more of the asthenic, than of the sthenic character; or it is more of the typhoid, than of the inflammatory type; a circumstance of great importance in the constitutional treatment of mortification. The fever in gangrenous affections is often accompanied with great uneasiness and restlessness, dejection of spirits, wildness of the looks; and, in severe cases, with almost always more or less delirium. In the progress of the disease, cold sweats, palpitations, and convulsions, sometimes occur; a hiccough, accompanied with nausea, often comes on, and proves a most distressing symptom to the patient. Frequently, this hiccough is the forerunner of death. Some patients die comatose; others, after suffering severe pains, spasms, and delirium. But, in some, a slow, in others, a sudden abatement of the constitutional symptoms takes place, accompanied also with the amelioration of the local affection. The gangrenous inflammation stops, and a red line is formed by the adhesive inflammation in the extreme verge of the living parts; the dead part separates, and granulations form; and when the constitution has strength to sustain the injury it has received, recovery takes place." (See *Lectures on Inflammation, p.* 509.)

In cases of sphacelus, the prognosis chiefly depends on the nature of the cause of the disorder. The more easy the cause is of removal, the less room is there for alarm. It is an erroneous supposition, that mortification arising from an external local cause, is more easy to be stopped and cured, than that originating from an internal one. The local cause is sometimes exceedingly difficult, or even incapable, of removal; and a sphacelus, which is at first entirely local, may afterwards become a general disorder, by the universal debility, and derangement of the system, resulting from the complaint. Hence, it is obvious, that a sphacelus may easily extend beyond the bounds of its outward local cause. On the other hand, a mortification may be reduced to one of a nature entirely local; though it arose at first from constitutional causes. Sphacelus from extreme debility, or from such a state of the system, as attends the scurvy, typhoid fevers, &c. is constantly perilous, because these causes are very difficult to remove. It is also a fact, that, when numerous causes are combined, it is an unfavourable occurrence, not merely because the surgeon is apt to overlook some of them, but, because there are in reality more obstacles to the cure.

There is a species of sphacelus, which spreads with very great rapidity, and, as the surgeon has scarcely time to employ the necessary means, the case is exceedingly dangerous. Sometimes, a mortification spreads so slowly, that it does not occupy much extent at the end of several months, or even a whole year. The case, however, is often not the less fatal on this account. The danger is never altogether over, until the dead part has completely separated. The entrance of putrid matter into the circulation (says Richter) is so injurious, that patients sometimes perish from this cause, long after the mortification has ceased to spread. (*Richter's Anfangsgr. der Wundarzn. Band* 1, *Kap.* 3, *p.* 78, 79.)

This last circumstance is very much insisted upon, by all the modern continental surgeons; but, I cannot pretend to determine, whether the doctrine is correct, or not. Certain it is, that few practitioners in this country entertain much apprehension of the bad effects of the absorption of putrid matter in cases of mortification.

The danger of sphacelus is also proportioned to the size and importance of the part affected. The event of the distemper likewise depends very much on the patient's age and constitution.

Parts, affected with gangrene, do not immediately lose the whole of their sensibility; the circulation is still continued in a certain degree; and when the progress of the distemper does not surpass certain bounds, the functions of such parts may be completely re-established. Gangrene, strictly speaking, is not a decided mortification; but, only the forerunner of this latter mischief, and may be regarded as the intermediate link, between the most violent stage of inflammation and sphacelus. The presence of this last implies the total loss of life in the part affected, the destruction of its organization, the abolition of all its functions, and an absolute inability to resume them again. However, even when we see the surface of a part manifestly sphacelated, we must not always conclude, that the entire destruction of its whole substance or thickness is certain; for, in many cases, the disorder only affects the skin and cellular substance. In this state, the integuments frequently slough away, leaving the tendons, muscles, and other organs, perfectly sound.

It is only in external affections of the body, that the progress of inflammation to gangrene and sphacelus can be marked with any degree of precision. The approaches of the latter are also not invariably announced by the distinct and manifest symptoms of gangrene, even when the disorder is quite superficial. There are cases, which justify the conclusion, that a small part of the body may be affected with sudden death, just in the same manner as the whole machine. Sphacelus is often seen making its appearance in a part, which is apparently quite healthy, without being preceded by any other symptoms, than a sudden acute pain in the seat of the mischief. Sometimes, in the earliest period of the complaint, a black spot, which rapidly spreads on every side, is the only change that can be observed.

In order to form a just prognosis, all the above circumstances must be taken into consideration, and, in particular, we must never deliver an opinion, without having closely examined the progress of the disorder; for, should we make a favourable prognosis from such appearances, as might justify us as much as possible in so doing, there is always great risk of finding ourselves most miserably mistaken by the event of the case. In all cases of considerable mortification, even when arising from an external cause, the patient cannot be deemed exempt from danger, not only while no separation of the mortified parts has begun, but, also, not before such parts have been completely detached from the sound ones.

### TREATMENT OF MORTIFICATION.

We shall arrange under two heads what we have to say on the treatment of mortification. Under the first, we shall comprehend every thing, which relates to internal remedies, and such other means, as are indicated by the general state of the system. Under the second, we shall speak of topical remedies, and of the local treatment of the parts affected.

In the treatment, the surgeon will always have one thing for immediate consideration; viz. whether the case before him is one of acute mortification, attended with inflammatory fever; or whether it is a chronic mortification, beginning without fever, or attended with a fever of a typhoid nature? By making up his mind upon this point, the practitioner will establish an useful general principle for his guidance, especially in the commencement of the treatment.

### GENERAL MEANS.

#### 1. *Evacuations and Antiphlogistic Remedies.*

When mortification is acute, and seems to depend on the violence of inflammation, the first indication is to moderate the inordinate action of the sanguiferous system, by the prudent employment of such means as are proper for counteracting inflammation. In short, relief is to be sought in the antiphlogistic regimen, which consists in the employment of blood-letting, purgatives, diaphoretics, and diluents, and in abstinence from all vegetable, or animal substances, which have a tendency to excite, or to augment the febrile action. It is a regimen, which must be pursued, so long as inflammatory fever continues. It is only in cases in which the fever from the first assumes a typhoid character, or where the mortification takes place without the previous occurrence of fever, that any deviation from the antiphlogistic regimen can be allowed.

Dr. Thomson, from whom I have borrowed the foregoing passage, also notices the present common aversion to bleeding in compound fractures, erysipelas, carbuncle, hospital gangrene, burns, and frostbite; cases in which the patient, it is said, can seldom bear with impunity any considerable loss of blood. "In many instances of these injuries and affections (says he) blood-letting, I know, is not required; but, I am doubtful, even if it were generally employed, whether it would produce all the mischiefs, which have of late years been ascribed to it. I believe it to be the most efficacious of any of the remedies that can be employed, in all cases of inflammatory fever threatening to terminate in gangrene, and that its use in such cases ought never to be omitted in the young, strong, and plethoric." (See *Lectures on Inflammation, p.* 559.) When bleeding has not been sufficiently practised, during the state of the inflammation antecedent to the mortification; when the general symptoms, which point out the existence of this state, continue violent; and, especially, when the pulse is still quick, hard, or full; it is absolutely necessary to empty the vessels a little more, even though mortification may have begun, particularly, if the patient be young and plethoric. Bleeding, by diminishing the fever, and abating the general heat, is frequently the best means of all. It may then be considered better, than all antiseptics, for stopping the progress of the disorder. But, this evacuation is to be employed with a great deal of circumspection; for, should it be injudiciously resorted to, from the true state of the system not being understood, the error may be followed by the most fatal consequences. It should also be well remembered, that how strongly soever bleeding may be indicated, the moment is not far off, when this evacuation is totally inadmissible, especially, if the mortification make much progress.

In cases of acute mortification, after as much blood has been taken away as may be deemed safe, or proper, still the other parts of the antiphlogistic regimen must be continued, as long as any increased action of the heart and arteries continues. "The use of purgatives seems to be particularly required in those cases, in which the local inflammatory affection is accompanied with derangement of the digestive and biliary organs. Antimonial diaphoretics are those, from which I should be inclined to expect most advantage in the commencement of the attack; but, after the inflammatory action has been subdued, opiates, either alone, or combined with antimony, or, what is still better, with ipecacuanha, as in Dover's powder, are frequently of singular service, not only by diminishing pain, but, also, by inducing a soft and moist state of the skin." (*Thomson, p.* 560.) A strict regimen, which may have been useful and even necessary, during the inflammatory stage, may have a very bad effect, if continued too long, by diminishing the patient's strength, which, on the contrary, should be supported by the most nourishing food.

A vegetable diet, as Dr. Thomson observes, is to be preferred in the commencement both of acute gangrene with inflammatory fever, and of chronic gangrene with a fever from the first of a typhoid nature. Wine and animal food given too early in diseases, which have a tendency to gangrene, increase the febrile heat and frequency of the pulse, oppress the stomach, render the tongue foul, the patient restless and delirious, and his situation dangerous, if not hopeless. In the transition from gangrene to sphacelus, an abatement of the symptomatic fever usually takes place in almost all cases, which have ultimately a favourable termination. Dr. Thomson believes, that *this is the first period, at which it is safe to allow vinous liquors, or diet, chiefly animal. P.* 561.

### 2. *Tonic and Antiseptic Remedies.*

Here we come to a second very essential and important indication to be fulfilled, as soon as the symptoms, announcing the existence of the inflammatory state, appear to abate, and the patient begins to be debilitated. This indication is to prevent excessive weakness by the suitable employment of cordials, and, particularly, of tonics. These same means also contribute to place the system in a proper state for freeing itself from the mortified parts, or, in other words, for detaching them. For, inflammation is the preparatory step, which nature takes to accomplish the separation of mortified parts from the living ones, and, such salutary inflammation cannot take place, if the energies of life be too much depressed in the rest of the system.

In order to fulfil the above indication, it is necessary to prescribe a nourishing diet, with a certain quantity of good wine, proportioned to the patient's strength, and the symptoms of the complaint. This diet is generally productive of more real benefit, than the whole class of cordial and stimulating medicines. However, when the patient is much weakened, when the mortification of the part affected is complete, and the disorder is spreading to others, some of the following remedies may be ordered: volatile alkali; aromatic confection, &c. In general, however, wine is best; because more agreeable than cordials, and, for this purpose, one ought to prefer the most perfect wines, such as those of Spain and Madeira.

Of all the medicines, hitherto recommended for the cure of mortification, there is certainly not one, that has acquired such a character for efficacy, as the Peruvian bark. It is said, that this remedy often stops, in a very evident and expeditious manner, the course of the disorder. Being a very powerful tonic, it is thought to operate by strengthening the system, and thus maintaining in every part the necessary tone for resisting the progress of mortification. But, whatever may be its mode of acting, the advocates for this medicine contend, that it is now a well-known fact, that it ought to be employed in almost all cases of mortification, as soon as the violence of the inflammatory symptoms has been appeased.

It was Mr. Rushworth, a surgeon at Northampton, who made this discovery in the year 1715. Amyand and Douglas, two surgeons in London, soon afterwards confirmed the virtue of this remedy. Mr. Shipton, another English surgeon, has also spoken, in the Philosophical Transactions, of the good effects, which he has produced by this medicine. In the Medical Essays, of Edinburgh, Dr. Munro and Paisley published several cases, illustrative of the efficacy of bark in cases of mortification. We there are informed, that when its exhibition was interrupted, the separation of the eschars was retarded, and that, on the medicine being resorted to again, such a separation went on again more quickly. Since this period, all practitioners, both in England, and elsewhere, have had recourse to this remedy, which has every where obtained the highest praises. Unfortunately, these praises have induced surgeons to employ it indiscriminately, and with equal confidence, in all cases.

We cannot indeed doubt, that bark has frequently had the most salutary effect, in cases of mortification, though sometimes it may probably have had imputed to it effects, which were entirely produced by nature. The following observation, made by Dr. Thomson, is highly worthy of recollection: "In attending to the effects, supposed to result from the operations of the external and internal remedies, which are daily employed for the cure of mortification, there are two facts, well-ascertained, which appear to me to be peculiarly deserving of your regard. The first of these is, that mortification often stops spontaneously, without any assistance whatever from medicine; the second, that it often begins, and continues to spread, or, even after it has stopt for a while, recommences and proceeds to a fatal termination, in spite of the best directed efforts of the healing art." (See *Lectures on Inflammation, p.* 557.) In many cases, bark is evidently hurtful, when exhibited prematurely. There are other instances, in which it is impossible to employ it in sufficient quantity, the stomach not being able to bear it in any form. In general, it should never be administered, when the pulse is high, and other inflammatory symptoms exist; but, when the tension of the part diminishes, the pulse sinks, when symptoms of weakness commence, and, particularly, when with these circumstances, we perceive a separation beginning to take place between the dead and living part, bark hardly ever fails to support the strength of the constitution, and powerfully to accelerate the separation of the mortified parts. (*Encyclop. Method. Art. Gangrene.*)

However, as we have already remarked, it is quite wrong to prescribe bark, in every instance, as the sole remedy; for there are many cases, in which it is unnecessary; some, in which it does harm; and others, in which it is totally inefficacious. It is a medicine obviously of no service, when the mortification arises from an external cause, and is the only complaint, in a healthy, strong constitution. It is equally unnecessary, when the sphacelus is of the dry sort, and has ceased to spread, at the same time, that the living margin appears to be in a state of inflammation, without any universal debility. But, it deserves particular notice, that the circumstances of each individual case are liable to such considerable variation, that though bark may be at first unnecessary, it may afterwards be indicated.

In some cases of sphacelus, bark is hurtful. The disorder is generally attended with fever, which may be of three kinds; inflammatory; typhoid; or one connected with a disordered state of the abdominal viscera.

In the latter case, which is far more common, than is supposed, bark is manifestly pernicious. Here, the indication is to empty the stomach and bowels, as quickly as possible. When this has been done, if bark should now be indicated by any of the circumstances, already pointed out, it may be safely administered. But, there is a great necessity, for procuring evacuations, as speedily as possible, before much debility has occurred.

Sometimes, mortification is accompanied with a low typhoid kind of fever, which, whether the cause, or the consequence of the local mischief, demands the exhibition of bark.

As we have above stated, the common inflammatory fever may attend a mortification, and then the living margin is generally inflamed and painful. This is particularly the case, when mortification is the consequence of genuine acute inflammation, or of an external injury, in a healthy subject. Here, bark must obviously be injurious. Still, it is wrong to regard this medicine, as invariably hurtful, whenever sphacelus is the effect of inflammation. It has already been observed, that the inflammation frequently has less share in the origin of the disorder, than some incidental cause, which oftentimes requires the exhibition of bark. It is also to be noticed, that even when mortification is the pure effect of inflammation, great prostration of strength may subsequently arise, and indeed does mostly take place at a certain period of the disorder. In this circumstance, the voice of experience loudly demands the employment of bark, though its exhibition might have been at first useless or hurtful. While the genuine inflammatory fever, and local inflammation, attend mortification, antiphlogistic means are undoubtedly useful. However, great caution is requisite in employing them, since, in cases of humid gangrene, as it is termed, the inflammatory state very soon changes into one, resembling that of typhus fever, &c.

Sometimes, there is mere prostration of strength, without any symptom of disorder in the gastric system, or of inflammation, or typhoid fever. A nervous fever is of this kind. In this instance, bark is evidently proper, though seldom effectual alone. At the same time, volatile, diaphoretic, and nervous medicines, are commonly proper, and opium, wine, and the volatile alkali, are such as experience has selected, together with the application of blisters.

From the preceding observations, it becomes evident, that though the method of treatment in cases of sphacelus, depends on the occasional cause, yet, it must also be regulated by the kind of fever, which, as we have described, may be either inflammatory, typhoid, one connected with gastric disorder, or nervous. Consequently, there are four plans of constitutional treatment, and it is easy to determine the particular cases, in which bark is unnecessary, hurtful, or inefficacious.

We meet with one species of mortification, in which the patient experiences severe pain in the part, without the smallest appearance of inflammation. Here bark is never of any use, and opium is regarded as the only medicine of much efficacy. We shall consider this subject more fully presently, when we introduce Mr. Pott's remarks on a peculiar mortification of the toes and feet.

Bark sometimes occasions purging, and then it also proves inefficacious, and hurtful. This effect, however, may frequently be prevented by adding a few drops of laudanum to each dose.

Bark may disagree with the stomach; but, it very seldom does so, when given in exceedingly fine powder, which also generally proves more efficacious, than a coarse one. Administering it with wine, some aromatic water, or in the form of the cold infusion, makes the medicine likewise less likely to disorder the stomach. (*Richter. Anfangsgr. der Wundarzn. Kap.* 3.)

Several years ago I published a critique on the indiscriminate employment of bark in cases of mortification, and my remarks were inserted in the article *Gangrene* in *Dr. Rees's Cyclopædia.* Many of them were introduced into the 2d edition of this Surgical Dictionary, printed in 1813. (See *Cinchona.*) Since this period, I am happy to find, that the blind enthusiasm with which bark was prescribed is beginning to subside, and that on this subject some eminent surgeons have of late publicly avowed sentiments, which entirely coincide with my former statements. "I think (says Dr. Thomson) I have frequently seen it prove hurtful, when administered in cases of mortification, by loading the stomach of the patient, creating a dislike to food, and sometimes by exciting an obstinate diarrhœa. *I believe it to be, in mortification, a medicine completely inert and inefficacious.*" (See *Lectures on Inflammation, p.* 563.) By this expression, Professor Thomson does not mean to say, that bark can never be useful in cases of mortification, but only that it has no specific power in checking the disorder, as many have erroneously inculcated.

"Bark (says Professor Boyer) has been considered by several distinguished English practitioners, as a true specific against gangrene in general, and especially against that, which depends upon an internal cause; but, subsequent observations to those published in England have proved, that it has no power over the immediate cause of gangrene, and that it only acts as a powerful tonic in stopping the progress of the disorder, and promoting the separation of the mortified parts." (See *Traité des Maladies Chirurgicales, Tom.* 1, *p.* 151, *Paris,* 1814.) Boyer also particularly objects to bark being given while inflammatory fever prevails; but, whenever he prescribes bark in cases of mortification, he seems to entertain the old prejudice of expecting benefit in proportion to the quantity, which can be got into the stomach. For further observations on bark, the reader is referred to the article, *Cinchona.*

The sulphuric acid may frequently be advantageously given at the same time with the bark, and the best method of exhibiting it is to acidulate with it every thing, which the patient drinks. Other acids are also sometimes used for the same purpose.

Carbonic acid gas is another remedy of the highest efficacy in cases of chronic mortification. It has even been known to have the most beneficial effects when bark has failed in doing good. Water impregnated with this gas should be recommended, as a most beneficial kind of drink.

The *hospital gangrene*, is a case, for which bark has been much recommended. The best mode of treating this particular case, however, has been detailed in a separate article. See *Hospital Gangrene.*

### 3. *Anodyne Remedies.*

A third indication, which should be observed together with the second, or which, should even precede it in many instances, is to lessen the irritability and sufferings of the patient, by the use of opium. Attention to this desideratum frequently contributes more, than any thing else, to stop the progress of the disorder, and is often indispensable in order to promote the operation of other remedies. In all cases of mortification, every thing, which heats, irritates, or adds to the patient's sufferings, appears, in general, to augment the disorder, and increase the rapidity of its progress. On the other hand, every thing which tends to calm, assuage, and relax, almost always retards the progress of mortification, if it produce no greater good. The pain also, which is a constant mark of too much irritation, contributes of itself to increase such irritation, and, in this double point of view, we cannot do better, in the majority of cases, than endeavour to appease it by the judicious and liberal use of opium. —When the inflammatory stage evidently prevails, this medicine may be conjoined with antiphlogistic remedies, such as the nitrate of potassa, antimony, &c. In other instances, attended with debility, it may be given with bark and cordials.

Mr. Pott has described a species of mortification, for which bark is most frequently ineffectual, and opium the remedy, which is to be depended upon. It is that particular kind, which, beginning at the extremity of one or more of the small toes, does, in more or less time, pass on to the foot and ankle, and sometimes to a part of the leg, and, in spite of all the aid of physic and surgery, most commonly destroys the patient.

It is very unlike to the mortification from inflammation, to that from external cold, from ligature, or bandage, or to that which proceeds from any known and visible cause, and this as well in its attack as in its progress. In some few instances, it makes its appearance with little or no pain; but, in by much the majority of these cases, the patients feel great uneasiness through the whole foot and joint of the ankle, particularly in the night, even before these parts shew any mark of distemper, or before there is any other, than a small discoloured spot on the end of one of the little toes.

It generally makes its first appearance on the inside, or at the extremity, of one of the smaller toes, by a small black or blueish spot; from this spot the cuticle is always found to be detached, and the skin under it to be of a dark red colour.

If the patient has lately cut his nails, or corn, it is most frequently, though very unjustly, set to the account of such operation.

Its progress in different subjects, and under different circumstances, is different; in some it is slow and long in passing from toe to toe, and from thence to the foot and ankle; in others its progress is rapid, and horridly painful: it generally begins on the inside of each small toe, before it is visible either on its under or upper part; and when it makes its attack on the foot, the upper part of it first shews its distempered state, by tumefaction, change of colour, and sometimes by vesication; but wherever it is, one of the first marks of it is a separation or detachment of the cuticle.

Each sex is liable to it; but (says Mr. Pott) "for one female in whom I have met with it, I think I may say, that I have seen it in at least twenty males. I think, also, that I have much more often found it in the rich and voluptuous, than in the labouring poor; more often in great eaters, than free drinkers. It frequently happens to persons advanced in life, but is by no means peculiar to old age. It is not, in general, preceded or accompanied by apparent distemperature either of the part, or of the habit. I do not know any particular kind of constitution which is more liable to it than another; but as far as my observation goes, I think that I have most frequently observed it to attack those, who have been subject to flying uncertain pains in their feet, which they have called gouty, and but seldom in those who have been accustomed to have the gout regularly and fairly. It has, by some, been supposed to arise from an ossification of vessels; but for this opinion I never could find any foundation but mere conjecture."

I have already in this article stated the observations of Cowper, Dr. J. Thomson, and Mr. Hodgson upon the ossified state of the arteries in this species of mortification. The facts, recorded by the two latter writers, at least prove, that the opinion is founded, not upon mere conjecture, as Mr. Pott alleges, but upon actual observation and experience.

With respect to the insufficiency of peruvian bark, Mr. Pott observes: "I believe I may venture to say, that I have tried it as fairly, as fully, and as variously as any man has or can; I have given it in the largest quantity, at the shortest intervals, and for the longest possible space; that is, as long as the patient's life would permit: I have given it by itself in decoction, extract, and substance; I have combined all these together; I have joined it with nitre, sal. absynth. with snake root, with confect. cardiac. with volatile salts, and with musk, as different circumstances seemed to require, or admit; I have used it as fomentation, as poultice, as dressing; I have assisted it with every thing which has been usually thought capable of procuring or assisting digestion; still the distemper has continued its course, perhaps a little more slowly, but still it has ended in death."

Mr. Pott afterwards relates the first cases in which he gave opium. His plan was generally to give one grain every three or four hours; but, never less, than three, or four grains, in the course of four and twenty hours. Mr. Pott, however, did not propose opium, as an universal infallible specific; but, only as a medicine, which would cure many cases, not to be saved by bark.

The observations of Mr. Pott on the local treatment of these cases are of great practical importance: no part of his writings has a stronger claim to attention.

"I have found (says he) more advantage from frequently soaking the foot and ankle in warm milk, than from any spirituous, or aromatic fomentations whatever; that is, I have found the one more capable of alleviating the pain, which such patients almost always feel, than the other; which circumstance I regard as a very material one. Pain is always an evil, but, in this particular case, I look upon it as being singularly so. Whatever heats, irritates, stimulates, or gives uneasiness, appears to me always to increase the disorder, and to add to the rapidity of its progress;

and, on the contrary, I have always found, that whatever tended merely to calm, to appease, and to relax, at least retarded the mischief, if it did no more.

"The whole plan of the chirurgic treatment of this disease is founded on a general idea of warming, invigorating, stimulating, and resisting putrefaction; and the means generally made use of are very proper for such purpose: but I must own that I think the purpose, or intention, to be improper."

Mr. Pott afterwards observes: "Cases exactly similar, in all circumstances, are not to be met with every day, but I am from experience convinced, that of two, as nearly similar as may be, in point of pain, if the one be treated in the usual manner, with a warm, stimulating, cataplasm, and the other only with a poultice made of the fine farina seminis lini, in boiling milk or water, mixed with ung. sambuc. or fresh butter, that the pain, and the progress of the distemper, will be much greater and quicker in the former than in the latter.

"When the black or mortified spot has fairly made its appearance on one or more of the toes, it is the general practice to scarify or cut into such altered part with the point of a knife or lancet. If this incision be made merely to learn whether the part be mortified or not, it is altogether unnecessary, the detachment of the cuticle, and the colour of the skin, render that a decided point: if it be not made quite through the eschar, it can serve no purpose at all: if it be made quite through, as there is no confined fluid to give discharge to, it can only serve to convey such medicines as may be applied for the purpose of procuring digestion to parts capable of feeling their influence, and on this account they are supposed to be beneficial, and therefore right.

"When the upper part of the foot begins to part with its cuticle and to change colour, it is a practice with many to scarify immediately; here, as in the preceding instance, if the scarifications be too superficial, they must be useless; if they be so deep, as to cause a slight hemorrhage, and to reach the parts which have not yet lost their sensibility, they must do what indeed they are generally intended to do, that is, give the medicines, which shall be applied, an opportunity of acting on such parts.

"The medicines most frequently made use of for this purpose are, like the theriaca, chosen for this supposed activity; and consist of the warm, pungent oils and balsams, whose action must necessarily be to stimulate and irritate: from these qualities they most frequently excite pain, which, according to my idea of the disease, is diametrically opposite to the proper curative intention; and this I am convinced of from repeated experience.

"The dressings cannot consist of materials which are too soft and lenient; nor are any scarifications necessary for their application. But I would go farther and say, that scarifications are not only useless, but, in my opinion, prejudicial, by exciting pain, the great and chiefly to be dreaded evil in this complaint. The poultice should be also soft, smooth, and unirritating; its intention should be merely to soften and relax; it should comprehend the whole foot, ankle, and part of the leg; and should always be so moist or greasy as not to be likely to become at all dry or hard, between one dressing and another."

When the toes are, to all appearance, perfectly mortified, and seem so loose as to be capable of being easily taken away, it is, in general, thought right to remove them. But, however loose they may seem, if they be violently twisted off, or the parts, by which they hang, be divided, a very considerable degree of pain will most commonly attend such operation, which therefore had much better be avoided; for Mr. Pott has seen this very pain, thus produced, bring on fresh mischief, and that of the gangrenous kind.

If the patient does well, these parts will certainly drop off; if he does not, no good can arise from removing them. (*Pott's Works.*)

Other practitioners have confirmed, by their experience, the efficacy of opium, in cases, in which the disorder is attended with a great deal of irritation, though it may not always have had the same success in their hands, when the mortification has appeared to depend chiefly on constitutional debility. Mr. Kirkland observes, that we must be careful not to force the doses, especially at first; and that the medicine does more harm, than good, when its soporific effects go so far as to occasion delirium, take away the appetite, or cause affections of the heart.

Some authors have also recommended the use of camphor, which, by reason of its narcotic virtue, has sometimes produced good effects. M. Pouteau attributes considerable efficacy to it, especially, in the erysipelatous gangrene arising from wounds. In such cases, he recommends it to be given in the dose of five grains, with a double quantity of nitre, every four hours. (*Encyclopédie Methodique; Partie Chirurgicale, art. Gangrene.*)

There are few surgeons of the present day, who believe that opium possesses as much power in the preceding cases, as Mr. Pott represented. While Dr. Thomson allows, that opium is much more entitled to the attention of practitioners, than bark, as an useful medicine in the treatment of mortification, yet, "in saying so much in favour of opium, (he observes,) I would not by any means have you to place the same reliance on its powers for stopping, even the mortification of the toes and feet in old people, which appears to have been done by Mr. Pott. From the trials, which I have made, and which I have seen made by others, I cannot allow myself to believe, that its powers in stopping this particular sort of mortification are greater, than in stopping any other form, or variety of the disease. It is obvious, however, from Mr. Pott's account, that his mind was strongly impressed with a very different opinion. His opinion seems to me to have been formed from the results of a very small number of cases, and in complete forgetfulness of the invaluable observations of his preceptor Mr. Sharp, with regard to the frequent spontaneous stoppage of mortification in cases in which no medicines whatever are used." (See *Thomson's Lectures on Inflammation, p.* 568.)

### LOCAL MEANS.

#### 1. *Suppression of irritating Causes.*

With respect to the external, or local treatment of mortification, the first indication consists in removing, if possible, such external causes, as may have occasioned, or kept up the disorder. Such are all those causes, which originate from the compression of bandages, ligatures, tumours, &c. Of this kind, also, are all irritating, and poisonous substances, which by their presence stimulate the parts, more or less violently, according to their particular nature.

#### 2. *Topical Applications.*

When mortification arises from inflammation, which still prevails in a considerable degree, it is evident, that the dead part itself only claims secondary consideration, and that the principal desideratum is to prevent the mortification from spreading to the living circumference, by lessening the inflammation present. Hence, under such circumstances, the application of linen, wet with the saturnine lotion, and the maintenance of a continued evaporation, from the inflamed parts surrounding the mortified flesh, must be just as proper as if the mortification itself did not exist, and were quite out of all consideration.

It has been justly remarked by a most eminent man, (*Hunter*) that the local treatment of mortification, (meaning that in consequence of inflammation) has been as absurd as the constitutional; scarifications have been made down to the living parts, in order that stimulating and antiseptic medicines might be applied to them; such as turpentines, the warmer balsams, and sometimes the essential oils. Warm fomentations have been also applied, as being congenial to life; but, warmth always increases action, and should, therefore, be well adjusted to the case; for, on the other hand, cold debilitates or lessens powers, when carried too far, though it first lessens action. Stimulants are likewise improper, as the actions are already too violent. It is proper to keep the parts cool, and all the applications should be cold. In cases of mortification from inflammation, good effects have also been seen to arise from the topical, as well as internal employment of opium.

But it must be acknowledged, that how proper soever the employment of cold applications may be in principle, in cases of mortification, attended with inflammation, fomentations and emollient poultices are most commonly preferred in practice.

Besides common poultices, there are several others, which have acquired great celebrity, as topical applications in cases of mortification. Of this kind are the cataplasma carbonis,[*] cataplasma cerevisiæ,[†] and the cataplasma effervescens[‡].

These local remedies are, perhaps, in nine cases out of ten, superior to all others.

With respect to stimulating, and spirituous applications, such as brandy, spirit of wine, balsams, resins, and aromatic substances, which have been recommended by a vast number of authors, they are at present almost entirely laid aside by practitioners. Though such things are indeed really very useful in preserving dead animal substances from becoming putrid, a very little knowledge of the animal economy is requisite to make us understand, that they cannot act in this manner on parts still endued with vitality; but, on the contrary, that they must have highly prejudicial effects, in the cases under consideration, by reason of the violent irritation, which they always excite, when applied to the living fibres. It may now and then, however, be justifiable to apply spirituous applications to the dead parts themselves with a view of diminishing the fetid effluvia, which, by contaminating the air, have some share in injuring the patient's health; but the greatest care is requisite to keep these stimulants from coming into contact with the living surfaces around, and beneath, the sloughs.

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[*] Prepared by mixing about ʒij. of finely powdered wood-charcoal with half a pound of the common linseed poultice.

[†] Prepared by stirring into the grounds of strong beer as much oatmeal, as will make the mass of a suitable consistence.

[‡] Prepared by stirring into an infusion of malt as much oatmeal, as will render the substance of a proper thickness, and then adding about a spoonful of yeast.

There are a few surgeons, however, who still place confidence in certain stimulating applications. "In the less acute and more chronic cases of gangrenous inflammation, as in malignant erysipelas and carbuncle, in the gangrene of the toes and feet of old people, in the sphacelating state of hospital gangrene, and in severely contused wounds, in which gangrene and sphacelus have supervened, the emollient poultice, which is applied to promote the separation of the dead parts, may have an addition made to it of a greater or less quantity of the unguentum resinosum, or even of oil of turpentine itself. In the more severe of these cases, where we have reason to dread the extension of the sphacelus, warm dressings, as they have been termed, which are formed by dipping pledgets of charpie in a mixture of equal parts of the unguentum resinosum and oil of turpentine, may be applied, of a temperature as hot as the patient can bear without pain; and over these we may lay an emollient poultice, of a large size and soft consistence.

"After the sphacelus stops, and the process of ulceration begins in the inflamed line of contact, between the dead and living parts, it will often be found, that the turpentine dressings are too stimulating, and occasion a considerable degree of pain. When this happens, we must either diminish the quantity of the turpentine in the dressings, or remove it altogether, according to circumstances. Besides the pain, a considerable extension of the ulceration would be, in general, the effect of continuing these applications after they begin to produce uneasiness. The ulcerating surface is, in the progress of separation, liable to pass under every mode of treatment, into the state of a painful and irritable ulcer; and in this state, it may require to be treated with decoctions of poppy-heads, or with the application of the turnip, carrot, fresh-hemlock leaf, stale beer, fermenting, poultices, &c." (See *Thomson's Lectures, p.* 577—578.)

The hospital gangrene is certainly a case, which requires topical stimulants; but this subject is elsewhere considered. See *Hospital Gangrene.* In most of the other cases specified by Dr. Thomson my experience leads me to prefer emollient soothing applications, none of which are stronger, than the cataplasma carbonis, or the stale beer, fermenting, hemlock, or carrot poultices. When the process, by which a slough is detached, is somewhat advanced, I have seen a weak solution of the extract of opium in water, put under the emollient poultice, along the line of separation, give considerable ease, at the same time, that it seemed to promote the changes, by which the dead parts were loosened.

In the gangrene, produced by pressure and weakness in persons, who are compelled by diseases and injuries to lie for weeks and months in one posture, the mode of treatment is a matter of extreme importance, and frequently makes the difference of life, or death, to the poor sufferer. This affection usually has its seat in parts, which are but thinly covered with muscular flesh. It occurs towards the latter stages of long continued febrile diseases, as after typhus, or hectic fever, attended with tedious suppurations; or even without these fevers, as in paralysis, and in very bad compound fractures. However, as Dr. Thomson observes, there are two forms of disease, arising from pressure, which have not always been accurately discriminated. One of these is the preceding sort of sloughing; the other is a chafed, excoriated, and ulcerated state of the parts.

Sometimes uncleanliness tends to cause this sort of mortification, that is, when the urine wets the patient's clothes. When this is the case, such irritation must be prevented by every possible means. If the skin be excoriated and broken, the powder of tutty, or lapis calaminaris, should be sprinkled over the part; or if an ointment be required, says Dr. Thomson, those, which contain tin or lead, are the best. But, when the ulceration threatens to extend, these remedies are to be laid aside, and an emollient, hemlock, carrot, or fermenting poultice used. (*P.* 580.) I have seen in the irritable state of such ulceration, the solution of opium under a common linseed poultice do more good, than any other application.

But, no topical remedies will in any of these cases avail, unless the chief cause of the disorder be removed. This is to be effected by change of position, and laying pillows and cushions of the softest materials in convenient places under the patient; not directly under the disease itself, but in situations, where they will tend to raise the parts affected from the contact of the bedding. A circular hollow pillow will often accomplish this important object; but, when possible, an entire change of posture is to be preferred.

When sphacelus succeeds to gangrene from pressure, I have often seen camphorated spirit applied; but, never with decided advantage. A common emollient poultice, and in very bad cases, the topical use of the solution of opium along the living margin, are the means, upon which I place most reliance, care being taken to improve the general health, without which grand indication, neither the removal of the pressure, nor the virtues of any dressings, will answer. Dr. Thomson speaks most highly of the fermenting poultice, which I believe to be in these cases an excellent application. He confesses, however, that he has sometimes found it too stimulating, and been obliged to substitute the simple emollient, carrot, or turnip poultice. (*P.* 580.)

When mortification arises from cold, every sort of warm emollient application must be avoided, and cold water, or even snow, or ice, made use of. For this subject, however, See *Chilblains.*

The local treatment of the mortification of the toes and feet, as described by Mr. Pott, has been already considered, and is that to which my observations incline me to give the preference.

### 3. *Scarifications, and Removal of the mortified Parts.*

The old practitioners used to give vent to putrid matter, extravasated in the cellular substance, by making deep scarifications in the integuments. The majority of authors who have treated of mortification, have very much insisted upon this plan, which they recommend in all kinds of cases. They even advise the incisions to be made down to the sound parts, in order to facilitate the application of topical stimulants, and to favour the operation of the supposed antiseptic qualities of these dressings. But, with the exception of cases, in which gangrene affects some aponeurotic membrane, and others in which the integuments, already mortified, are exceedingly distended with putrid matter collected in the cellular substance, either in consequence of foregoing inflammation, or any other cause, such as the extravasation of urine in the scrotum, all scarifications, which penetrate as far as the living parts, are often productive of the most serious mischief, instead of advantage. Such incisions cannot be practised, without occasioning a great deal of pain, and producing inflammation, which itself often powerfully contributes to make the mortification spread. But, as parts, which are in a complete state of sphacelus, are absolutely extraneous substances, in regard to those which still retain their vitality, they require no concern, and when their mass is considerable, it is not only proper to scarify them, but also to remove a portion of them. By lessening the size of the putrid mass of matter, the fetor is diminished, which, in this case, is always considerable; we also make way for the escape of a great deal of putrid discharge, which, being confined, might have a bad effect on the neighbouring living parts; and we enable these latter to free themselves more easily from the rest of the sloughs.

From what has been already said, it must appear, that scarifications are only to be employed with the greatest prudence, lest they should increase the disorder, which they are intended to benefit.

The same may be said of the too common practice of accelerating, with a cutting instrument, the separation of the mortified parts, which process nature tends to accomplish. It is always dangerous to irritate parts, which are affected with inflammation, in cases of sphacelus, before they are completely restored to their natural state, and in having recourse to the abovementioned operation, while there is any adhesion remaining, between the slough and the living parts, it is impossible to avoid producing irritation in the latter. We have already given Mr. Pott's sentiments with respect to the danger and inutility of cutting the tendons and ligaments, in the mortification of the toes and feet.

If the surgeon prudently await the event of things, the separation of the mortified from the living parts, will in general be soon effected, when inflammation and suppuration at the edges of the slough, have set bounds to the expansion of the sphacelus.

But, when the whole thickness of a limb is affected with mortification, ought the surgeon to leave things to nature? or ought he to have recourse to amputation?

In general, the performance of amputation will be indispensable; not that nature would not in many instances detach the sphacelated part; but, because a great length of time would be required for the completion of the process, and a good serviceable stump would rarely be left.

Another important question then arises, should the surgeon amputate, while the mortification is in a spreading state? Or ought he to defer the operation, until a line of separation begins to form between the dead and living parts?

"Amputation (says a distinguished professor) was long regarded as one of the most effectual means which could be employed to prevent the extension of gangrene. This practice, however, has not received the sanction of experience; on the contrary, it has been generally found, wherever it has been practised, in either acute or chronic gangrene, to accelerate much the progress of the disease; and, in this way, to hasten the death of the patient. The parts, which were divided in amputation, though at a distance from a spreading gangrene and from sphacelus, were found speedily to assume the appearance of the affection, for which the operation had been performed. *Till, therefore, the adhesive inflammation comes on, and a distinctly* *marked separation of the dead from the sound parts takes place, amputation is, in few, if any cases of mortification, admissible.* We never know, previously to this, where a gangrene, or sphacelus, is to stop, nor whether the powers of the constitution be sufficient to sustain the injury that the mortification has inflicted. Even when the adhesive inflammation comes on, it is in most cases best to allow some time to elapse before we operate, partly with a view to give time for the constitutional symptoms to abate, in other instances, to allow the patient's strength to be recruited by nourishment and cordials; and partly also with a view to learn whether the constitution of the patient be indeed capable of so great a fresh shock, as that which amputation must necessarily occasion." (See *Thomson's Lectures, p.* 582.)

According to Richter, there is never any certainty, that we are amputating in living parts. Mortification rapidly ascends along the cellular substance, surrounding the large blood-vessels, and is frequently much more extensive internally, than external appearances would lead one to suppose. The adjacent surface, still apparently alive, is often so affected, that it must inevitably slough, though, at present, it may not actually have sphacelated. The surgeon imagines, that amputation is performed on living parts; but, soon afterwards discovers, that he has been dividing those which are dead. (*Richter's Anfangsgr. der Wundarzneykunst, Band.* 1, *Kap.* 3.)

The operation, he observes, can do no good, while the mortification is in a spreading state, and it may do considerable mischief. The disorder enlarges its limits, because its cause still operates, and this is not removable by amputation. If the operation be now injudiciously undertaken, the sphacelus invades the wound, and is the more certainly mortal, as the patient has been further weakened by amputation, and its consequences.

Many mortifications, especially those, which arise from external causes, very often spontaneously stop and separate. But, the place, where this will happen, can never be foreseen. By amputating in this circumstance, we run a risk of disturbing nature in her salutary work, and rendering the disorder fatal. Richter, indeed, is an advocate for leaving the separation of all mortified limbs to nature, instead of amputating.

The following are the only cases, in which he allows that the use of the knife is justifiable and proper. There exists a species of sphacelus, which rapidly occasions death, before it is yet of great extent. Here indeed, amputation might be really advisable; but, the nature of the case is unfortunately never disclosed, before the fatal catastrophe. Some external injuries would be, without the operation, inevitably followed by mortification. In such cases, early amputation is evidently proper; for, the simple incision is attended with less danger, than the sphacelus would be.

Sometimes, says Richter, a sphacelus spontaneously ceases to spread. This happens most frequently in cases which originate from an external cause, such as a violent contusion, burn, &c. But, the occurrence is not restricted to this kind of case, nor is it invariably attendant on it. When there are no other occasional causes present, the mortification does not readily go beyond the limits of the contusion, or violent burn; but the interference of surgery can hardly ever put a stop to its progress before it has spread as far as the extent of the local injury. (*Richter's Anfangsgrunde der Wundarzneykunst, Band.* 1, *Kap.* 3.)

How different are the doctrines of M. Larrey upon this subject from those entertained by Richter, and, indeed, the generality of eminent modern surgeons. "Writers on gangrene, or sphacelus of the extremities (observes M. Larrey) indiscriminately recommend the amputation of a sphacelated limb never to be undertaken before the mortification is bounded or limited by a reddish circle, forming a true line of separation between the dead and living parts. This circumstance can only occur in a case of spontaneous gangrene from an internal cause; or if it happens, as is very unusual, in a case arising from a wound, its progress is different, and it would be exceedingly imprudent to wait for it. *The gangrene from external injuries almost always continues to spread; the infection becomes general; and the patient dies.*" (*Larrey in Mém. de Chirurgie Militaire, Tom.* 3, *p.* 142) On the other hand, this author asserts, that, in the dry, or spontaneous gangrene, absorption takes place with more difficulty, and it is not uncommon to see the sphacelated parts separate from the living ones by the powers of nature alone, without the general functions being impaired. He argues, that there is a manifest difference, between what he terms the *traumatic* and the *spontaneous* gangrene, or, in other words, between the *humid* gangrene from an external cause, and the *dry* gangrene, which ordinarily proceeds from an internal cause. (*P.* 148.)

In cases of mortification arising from external injuries, M. Larrey maintains, that, "notwithstanding any thing that writers and practitioners may allege to the contrary, we should not hesitate about promptly performing amputation, as soon as the necessity for the operation is decidedly established. There is no reason to apprehend, that the stump will be seized with gangrene, as in the spontaneous mortification, that has not ceased to spread, because the traumatic gangrene, after having arisen from a local cause, is only propagated by absorption, and a successive affection of the texture of parts by continuity of the vessels. Amputation, performed in a proper situation, stops the progress and fatal consequences of the disorder.

"Supposing then the lower half of the leg should be affected with sphacelus, in consequence of a gunshot injury, attended with a violent contusion of the part, and a forcible concussion of the vessels, nerves, and ligaments, if the skin is elsewhere uninjured, the operation may be done in the place of election, without any fear of the stump becoming gangrenous, notwithstanding the cellular membrane of the upper part of the member may be already affected. But, when the skin of the whole leg is struck with mortification the operation must be done on the thigh, and no time should be lost. The same practice is applicable to the upper extremities. We must be careful not to mistake a limb affected with stupor for one that is actually sphacelated. In the first case, warmth, motion, and sensibility are still retained, although the skin may be blackish and the parts may be swollen. Besides, if there were any doubt, it would be proper to try at first tonic repellent applications, and cordial medicines, &c." (*Larrey in Mém. de Chirurgie Militaire, Tom.* 3, *p.* 152, 153.)

"When amputation has been practised, this author recommends the exhibition of bark, good wine, tonics, &c. in order to promote the good effects of the operation." (*P.* 154.)

"The facts, (says M. Larrey) which I shall relate in the course of this dissertation, will prove, I think, in an incontestable manner, the truth of the principle, which I lay down, that, *when gangrene is the result of a mechanical cause, and puts the patient's life in danger, amputation ought to be performed, without waiting until the disorder has ceased to spread.*

"I have been a witness of the death of several individuals, from too rigorous an adherence to the contrary precept; and at length grievously impressed with this loss, I had long ago determined to depart from an axiom, which was always considered by me as false. Besides, following the maxim of Celsus, I preferred employing an uncertain remedy, rather than abandon the patient to an inevitable death. *Satius est enim anceps auxilium experiri quàm nullum.*

"I made the first attempt at Toulon, in the year 1796, upon a soldier, who, in consequence of a violent contusion of the foot, was afflicted with a gangrenous ulcer, which soon threw the whole limb into a sphacelated state. While the mortification was yet spreading, I resolved to amputate the leg. The success of the operation surpassed my expectations; the stump healed; and, in less than forty-five days, the patient got quite well. This case served to encourage me.

"During the siege of Alexandria, in Egypt, in 1801, a second case, very analogous to the preceding, occurred in my practice; it happened in a dragoon of the 18th regiment, whose forearm and afterwards arm sphacelated, in consequence of a gunshot wound in the articulation of the left arm. The mortification had extended nearly as high as the shoulder, and the patient's life was in great danger, when I determined to amputate the limb at the shoulder-joint. The disorder was manifestly spreading, and the patient's brain already affected, for he had symptoms of ataxia: the operation, however, arrested the progress of the sloughing, and saved the patient's life, who, at the conclusion of the siege of Alexandria, was quite cured.

"After the taking of Ulm, M. Ivan, surgeon to his majesty the Emperor, performed in my presence, and at my ambulance established at Elchingen, the amputation of the thigh of a soldier belonging to the 76th regiment of the line, the leg having sphacelated in consequence of a gunshot injury. The gangrene was not limited, and evidently continued to extend itself: notwithstanding this the effects of the infection were destroyed, and the patient was quite cured on our return to Austerlitz.

"A fourth patient, an officer in the same regiment, shot in the ankle, at the capture of the same town, was conveyed to my ambulance, in order to be dressed: it was the third day after the accident; the foot was gangrenous, and the leg was swelled and threatened likewise with mortification. Febrile symptoms had also come on. I hastened to amputate the leg a little above the place of election. The cellular membrane of the stump, of a yellow blackish colour, was already infected with the gangrenous principle, (as M. Larrey terms it.) The operation, however, stopped the progress of the mischief; suppuration took place in the stump; some sloughs were detached; the wound assumed a cleaner appearance; and cicatrization was completed on the 52d day. The patient could already walk with a wooden leg, when he caught the hospital fever, which was epidemic at Ulm, where he awaited his regiment, and, to my great regret, he was carried off by this disease, after having escaped the former danger.

"After the battles of Austerlitz and Jena, (continues M. Larrey) several of my colleagues, surgeons of the first class, undertook, in consequence of my advice, and the examples of success, which I had recited to them, the amputation of limbs equally sphacelated, although the mortification was not limited, rather than abandon the patient to a death, which appeared inevitable. In general, these practitioners experienced the same success, as I did myself." (*Larrey, in Mém. de Chirurgie Militaire, Tom. 3, p.* 154—157.)

In M. Larrey's memoir upon this subject, there are some additional facts and arguments in favour of what he endeavours to prove, viz. that, in cases of mortification from external injuries, if the patient's life is in danger, amputation ought to be performed, although the sloughing may yet be in a spreading state. I must be content, however, with having stated the particulars already explained; and the reader, desirous of more, must refer to M. Larrey's own publication. Certainly, the facts, which this gentleman has adduced, are highly important: they tend to subvert a doctrine, and to prove the error of a practice, which have been urged in most forcible terms by all the distinguished surgeons of modern time. The sentiments of Mr. Sharp are rendered questionable; and the truth of the positive assertions of Mr. Pott is yet a matter to be examined. The latter, it is well known, tells us, that he has often seen the experiment made of amputating, while a mortification was spreading, but never knew it answer. Are we to conclude, that all these cases, which Pott alludes to, were mortifications from an internal cause? Or, are we to suppose that the operation failed from having been delayed too long? Or, must we imagine, that the nature of the human constitution has been changed between the æra of Mr. Pott and that of M. Larrey? The last gentleman's facts are too well authenticated to admit of being disbelieved.

It should be remarked, that the practice of amputation, in cases of spreading mortification, has generally had some partisans for many years past; but, the weight of authorities has unquestionably been against it, and few surgeons in this country have ventured to deviate from the advice of Sharp and Pott. It is curious, however, that M. Mehee, a writer who wrote for the express purpose of declaring his disapprobation of the early performance of amputation in gun-shot wounds, should have admitted of only one case, in which the operation is proper, namely, *gangrene succeeding the wound made by a cannon shot.* Here he thinks, that amputation ought to be performed on the first appearance of the gangrene, in order to prevent it from spreading up the limb. (See *Traité des Plaies d'Armes à feu, Paris* 1799.) It appears, that about the year 1809, Dr. Hutchison performed with success two amputations in cases of spreading gangrene from gun-shot wounds. (See *his Practical Observations on Surgery, p.* 72.)

My friend Mr. Lawrence has also successfully amputated at the shoulder joint in a spreading mortification of the arm, the consequence of external violence. "The skin of the amputated limb was greenish and livid; but, the cuticle not yet detached. The cellular substance distended with air, and with a discoloured offensive sanies; its appearance was not quite natural, where the incision took place; it was yellowish and anasarcous. Small effusions of blood were observed here and there in the course of the nerves; even as high as the amputated part. No coagulation of blood in any of the arteries, even down to the ulnar and its digital branches. All the soft parts were discoloured, dark red and livid, and a frothy reddish fluid issued on incision." This case had the most favourable termination, and it clearly proves, that the *humid* kind of gangrene which occurs in a healthy subject from severe local injury, which so rapidly affects a whole limb, and reaches the trunk in a few hours, must constitute an exception to the general maxim, that amputation should never be done, before a line of separation is established between the dead and living parts. Mr. Lawrence, however, would not be understood as meaning to recommend the practice in all instances of mortification from local injury. He conceives, that a gangrene may arise, in an unsound constitution, from a comparatively slight accident; so that it may be regarded as the result of constitutional disposition, rather than of the local cause. Amputation would be hopeless under such circumstances. It is particularly in mortification, following very severe injury, in a subject otherwise healthy, that Mr. Lawrence believes the operation to be proper. (See *Medico-Chir. Trans. Vol.* 6, *p.* 184.)

Mr. Lawrence also reports another instance, in which he saw the operation succeed, though the mortification was in a spreading state *.

### 4. *Application of Caustic Substances, and of the Actual Cautery.*

Having explained the chief indications in the treatment of mortification, we proceed to notice some particular means, which have been recommended by practitioners of eminence, as being in certain cases very efficacious. We allude to some caustic substances, and even the actual cautery, which have sometimes been successfully employed in this disease.

One of these applications is the muriatic acid, more or less diluted with water. It was Van Swieten, who particularly recommended this remedy; he mixed the acid with six times its quantity of water, and applied it as a fomentation to the mortified part, after making deep scarifications. In this manner he stopped, or seemed to stop, a mortification, arising from a violent inflammation of the scrotum and penis, and which extended all over these parts. The same author strongly recommends the same topical application to the sloughy state of the gums in cases of scurvy. In this kind of case, he mixed the muriatic acid with honey, in various proportions; sometimes, he even employed the pure acid itself for touching the parts, which were likely to slough. It is easy to comprehend, that the muriatic acid, as well as other mineral acids, and vinegar, weakened with a sufficient quantity of water, may act as an antiphlogistic, and antiseptic; but, when it is concentrated, its manner of acting is then very different, as it is a real caustic, and its salutary effects can only be explained by the change, which it produces in the nature of the inflammation, which now becomes favourable to the formation of the healthy pus.

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* Since this sheet was corrected, I have seen amputation at the shoulder performed in a spreading mortification of the arm from external violence. The patient lived a fortnight afterwards, which is favourable to the practice, inasmuch as the patient would certainly have perished in a few hours, if the operation had not been done.

It is only in the same way, that we can account for the good effects, attributed to another, much more active caustic, than the muriatic acid, namely, a solution of mercury in the nitrous acid, with which solution the edges of the mortified part are recommended to be wet. This, it is said, stops the progress of mortification. We are not, however, possessed of a sufficient number of facts in support of such practice. An example mentioned by a judicious author, Mr. Kirkland, deserves attention.

A man met with a fracture of the fore-arm, and the ends of the bones projected through the integuments. The fracture was very expeditiously reduced; but, at the end of five, or six days, the whole arm seemed to be completely mortified up to the shoulder. Amputation was performed as near the joint as possible, and the stump, which had mortified as far as the acromion, was cauterised. The following day the mortification had reached the inferior extremity of the scapula. A little of the solution of mercury in nitrous acid was now applied, by means of a probe, along the edges of the parts affected, and from this moment the disorder made no further progress. This cauterisation was repeated every day, for seventeen, or eighteen days. The sloughs, and even the scapula itself, were detached, and the patient got well.

On the continent, liquid caustics are sometimes used as topical applications to gangrenous diseases, more especially, however, in cases of hospital gangrene, and malignant carbuncle. Of this last disorder, M. Larrey has recorded a very dangerous example, in which he effected a cure by first cutting away as much of the sloughs as possible, and then applying to the disorganized surface underneath liquid caustics. Under the use of emollients, two persons had already fallen victims to the disease in the same family. (See *Mémoires de Chirurgie Militaire, Tom.* 1, *p.* 53.)

With respect to the actual cautery, Celsus has recommended it to be applied to the line, which separates the dead parts from those which are still living, whenever medicines, and, particularly, topical emollient applications fail in stopping the progress of the disorder. M. Pouteau ventured to revive this practice, which had been entirely exploded from modern surgery, and he was of opinion, that the method might have the most beneficial effects, in cases of erysipelatous gangrene, which is so often seen in hospitals, in consequence of wounds. For this purpose, he recommends cauterizing chiefly the edges of such parts, as are of a dark red colour, and are on the point of perishing; and he advises this to be done with a heated iron, or boiling oil, and to repeat the cauterisation of the dead parts, at every time of dressing them, until the sensation of heat is even felt with a certain degree of force in the sound parts. The whole of the affected part is afterwards to be covered with a large emollient poultice.

M. Pouteau relates a very interesting case of an anthrax, which took place on a woman's cheek, and which he cured in the above manner. The tumour, which, on the third day, was quite black, and as large as a walnut, was accompanied with an erysipelatous œdema, which extended over the whole cheek, eyelids, and front of the neck. M. Pouteau, after having opened the tumour in different directions with a lancet, introduced the red-hot cautery, and repeated the application several times, until the heat was felt by the sound flesh. The patient felt herself very much relieved immediately after this had been done; an oppressive headach, and a very afflicting sense of strangulation, which she had before experienced, were got rid of, and, in ten days more, the slough was detached on the occurrence of suppuration. (*Encyclopédie Méthodique, Partie Chirurgicale, Art. Gangrene.*)

But, perhaps, of all the species of mortification, the hospital gangrene is that, for which the use of caustics and the actual cautery itself, has had the most numerous and respectable advocates. The heated iron is even now employed by the first surgeons of Paris for this particular case. (See *Sketches of the Medical Schools of Paris by J. Cross, p.* 84.) This subject, however, is particularly considered in another article. (See *Hospital Gangrene.*)

The foregoing observations are introduced into this work, that the reader may not be left entirely ignorant of what violent measures have been adopted in cases of mortification, and the account is not given, in order that such practice may be again imitated. The employment of these terrible applications, viz. the actual cautery, and boiling oils, is as unscientific, and unnecessarily painful, as it is unproductive of any essential good. The grand object in almost every case of mortification, is to diminish the irritation of the parts in immediate contact with those already dead. This is indicated, lest the parts still alive, and so situated, should experience the same fate, as the contiguous ones. Some who have reprobated the application of spirituous and resinous substances to parts affected with mortification, and who have also condemned incisions and scarifications, give their approbation to the use of the cautery. They assert, that the manner, in which the latter acts, is essentially different from that, in which spirituous and resinous applications operate, and that while these, by irritating the affected parts, tend to increase and propagate the inflammation, that leads to mortification, the lively action of the cautery changes the nature of such inflammation, and establishes that state of the vessels, which is necessary for a favourable suppuration. They state, also, that the cautery gives a tone to the vessels, in the vicinity of the parts to which it is applied, and, in proof of this remark, they refer to the effects of the application on different ill-conditioned ulcers, and particularly, on carious bones. (*Encyclopédie Methodique, Partie Chirurgicale, Art. Gangrene.*)

Notwithstanding these assertions, I shall venture to congratulate the surgeons of this country in particular, on the total rejection of the use of the actual cautery and boiling oils, in cases of mortification.

Consult *Fabricii Hildani Tract. Methodicus de Gangrena et Sphacelo. Quesnai, Traité de la Gangrène; Paris* 1749. *Encyclopédie Méthodique, Partie Chirurgicale, Art. Gangrene. Kirkland on Gangrene, and on the Present State of Medical Surgery. Richter's Anfangsgr. der Wundarzneykunst, Band.* 1, *Kop.* 3. *Various parts of Hunter on Inflammation, &c. Sharp's Critical Enquiry into the present State of Surgery, Chap.* 8. *Richerand's Nosographie Chirurgicale, Tom.* 1, *p.* 215. *&c. Edit.* 4. *Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 30, *&c. Edit.* 1809. *Levéillé, Nouvelle Doctrine Chirurgicale, Tom* 4, *p.* 321, *&c. Paris* 1812. *Larrey, Mémoires de Chirurgie Militaire, Tom.* 3, *particularly, the Mém. sur la Gangrène de Congélation, p.* 60, *and that sur la Gangrène Traumatique, p.* 141. *Callisen, Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 374, *Edit.* 1800. *Dr. J. Thomson's Lectures on Inflammation, p.* 501; *Edinb.* 1813. *O'Halloran on Gangrene Sphacelus, Lond.* 1765. *Pott's Obs. on the Mortification of the Toes and Feet in his Chirurg. Works, Vol.* 3. *Observations on Gangrenes and Mortifications, accompanied, &c. with convulsive spasms; by Charles White. Pearson's Principles of Surgery, p.* 114, *Edit.* 2. *Lawrence in Medico-Chirurgical Trans. Vol.* 6, *p.* 184, *&c. Delpech, Mémoire sur la Complication des Plaies et des Ulcères, connue sous le nom de Pourriture d'Hôpital: also his Précis Elémentaire des Maladies Réputées Chirurgicales, Tom.* 1, *p.* 73, *&c. Paris* 1816. *Boyer, Traité des Maladies Chirugicales, T.* 1, *p.* 105, *&c. Paris,* 1814. *John Bell's Principles of Surgery. Professor Himly's Abhandlung über der Brand der Weichen und harten Theile. Gottingen,* 1800. *For an account of the dry gangrene, see particularly the writings of Hildanus; Tulpius Quesnai; Mémoires de la Societé Royale de Medecine, Tom.* 1; *Opere di Bertrandi; Medical Museum; &c. For a description of the mortification caused by eating cockspur rye, see M. Dodard's letter in Journal des Savans* 1676; *Noel, in Mém. de l'Acad. des Sciences* 1710; *Langius, "Descriptio Morborum ex esu Clavorum Secalinorum." Duhamel, in Mém. de l'Acad. des Sciences* 1748. *Dr. C. Woolaston in Philosophical Trans.* 1762. *Tessier in Mém. de la Societé Royale de Médecine, Tom.* 1 *and* 2, *&c.*

MOXA (Japanese). A soft lanuginous substance prepared from the young leaves of a species of mugwort. It is used in the following way: A little cone of the moxa is laid upon the part, previously moistened, and set on fire at the top. It burns down with a temperate glowing heat, and produces a dark-coloured spot, the separation of which is promoted by applying a little garlic. The ulcer is left to discharge, or is healed up according to the object in view. The moxa is famous in the East for curing several diseases; and the French are much in the habit of using it; but, whenever English surgeons wish to produce a slough, they have recourse to caustics, in preference to actual fire.

M. Roux, when he lately visited the London hospitals, had two opportunities afforded him of applying the moxa, in order to convince the rising generation of surgeons in this country of its superior efficacy. The first was in a case of spontaneous paralysis of the deltoid muscle at St. Bartholomew's. The moxa was applied a little below the acromion, and a few days afterwards the motion of the arm began to be restored. This, however, was a case, which, according to the account of M. Roux himself, had relapsed, after having been cured by other means. I think one of the surgeons of St. Bartholomew's informed me some time ago, that notwithstanding the moxa, the relief proved again only temporary. If, however, the moxa had succeeded, a caustic issue, a blister, or volatile liniments, would probably have answered equally well. The second instance, in which M. Roux applied the moxa, was a case of white-swelling at Guy's Hospital; but, the disease had advanced too far to allow any hope of a favourable issue. (See *Voyage fait à Londres en* 1814, *ou*

*Parallèle de la Chirurgie Angloise avec la Chirurgie Française, p.* 19—20.) M. Roux flatters himself that, "*les chirurgiens Anglois répugneront sans doute moins à l'avenir à faire usage du moxa.*" The truth is, English surgeons, as well as English farriers, knew very well before the arrival of M. Roux what might be done with moxa and the actual cautery. But, though the application of fire still prevails in the veterinary art, as a mode of curing diseases, it has long been abandoned as a means of relief in the English practice of surgery; not on the ground of its being always ineffectual; but, because equal good has been found to result from measures, which are milder, always less terrific, and frequently less painful. In order to convince an English surgeon that moxa and the actual cautery ought to be introduced into practice, M. Roux should prove, that there is at least some particular disease, which may in this manner be cured, but, which cannot be cured by other means ordinarily employed in our practice. He should also make us forget, that the application of actual fire was once as common in English surgery as in French; but that it had not attractions enough to maintain its ground.

MYDRI'ASIS. (from *μυδαω*, to abound in moisture.) A preternatural dilatation of the pupil.

# N.

NÆVUS. (*Congenitæ Notæ; Envies; Mutter-mahl; Mother-spots, &c.*) A mole, or congenital mark, or excrescence of the skin. Nævi materni signify the little spots, excrescences, or swellings, with which many children are born. Some of them (says Dr. Bateman) are merely superficial, or stain-like spots, and appear to consist of a partial thickening of the rete mucosum, sometimes of a yellow, or yellowish brown, sometimes of a blueish, livid, or nearly black colour. To these the term *spilus* has been more particularly appropriated. Others again exhibit various degrees of thickening, elevation, and altered structure of the skin itself, and consist of clusters of enlarged and contorted veins, freely anastomosing, and forming little sacs of blood. These are sometimes spread more or less extensively over the surface, occasionally covering even the whole of an extremity, or one half of the trunk of the body; and sometimes they are elevated into prominences of various form and magnitude. Occasionally, these marks are nearly of the usual colour of the skin; but, most commonly they are of a purplish red colour, of varying degrees of intensity; such as the presence of a considerable collection of blood-vessels, situated near the surface, and covered with a thin cuticle, naturally occasions. (See *Bateman's Practical Synopsis of Cutaneous Diseases, p.* 324. *Edit.* 3.) When a nævus is of a dark red colour, its intensity is generally augmented by every thing, which tends to accelerate the circulation of the blood. Fits of anger, hot weather, fevers, and the period of menstruation, in particular, are observed to be attended with an increased turgescence and discoloration of the part affected. Indeed, the excrescence sometimes bursts, and pours out a dangerous quantity of blood, and in females it has been known to become the seat of a regular menstrual discharge. (*Boyer, Traité des Maladies Chir. T.* 2, *p.* 277; *and John Bell's Principles, Discourse* 9.) Some nævi, especially those usually called *moles*, frequently have long, irregular hairs growing upon them; while the surface of others is streaked, and even granulated. Such as appear in the form of a mere red, purplish stain, have been absurdly supposed to arise from a desire for claret, or some other wine of that colour, entertained by the mother of the patient during her pregnancy. The granulated nævi have been compared with raspberries, strawberries, mulberries, &c. for which the mother's longing is ascribed by the vulgar as a cause. The truth is, however, that this doctrine, imputing the origin of nævi to fancies of the mother, is neither consistent with experience, nor sound physiology. The causes (as Callisen observes) "potius autem in evolutione primorum flaminum, a naturæ solita via aberrante, uti in aliis rebus monstrosis quærendæ erunt." (*Syst. Chir. Hodiernæ, Vol.* 2, *p.* 201.)

From what has been said, then, it appears, that certain nævi are merely cutaneous spots, of a red, violet, or purplish colour, of greater or lesser extent, and with scarcely any perceptible elevation. They are an organic malformation of the skin, the natural texture of which does not exist, but has substituted for it a plexus of vessels, not endued with the natural sensibility of the cutis itself. These nævi generally continue stationary during life, and may be regarded rather as a deformity, than a disease. (*Lassus, Pathologie Chir. Tom.* 1, *p.* 477.) Other nævi are either of the same nature as the disease, well known by the name of the "aneurism by anastomosis," or bear a considerable resemblance to it. They are sometimes of great size; and their shape is subject to much variety. They are soft, and indolent, and of a violet, or dark red colour. The skin which covers them is very thin, and when they are opened, their structure is like that of a spleen, whose blood-vessels are varicose. Some are covered with a delicate white skin, and do not increase with age. Others are more disposed to grow large. These tumours frequently occur in the skin of the face, and in other parts of the integuments, on the inside of the labia pudendi, and cheeks, and in the substance of the upper and lower lip, where they sometimes form a kind of elongation, attended with great disfigurement. Nævi of this kind, so situated in new-born infants, may produce a serious obstacle to the action of sucking. M. A. Severinus has particularly described them under the appellation of "tuberculum atro-cruentum labii inferioris." (*De Abscessuum natura, Cap.* 29, *p.* 303.)

The nævi, which form in the subcutaneous cellular substance, and were named by Petit "loupes variqueuses," (*Œuvres Posthumes, Tom.* 1, *p.* 276.) are also of the same nature as the aneurism by anastomosis. In time, these attain a very large size. Mr. Latta says, he once saw in a child, two years old, a tumour of this kind, weighing fourteen ounces, which, at the time of birth, was only equal in size to a large bean. During the first year, it did not enlarge much; but it afterwards grew rapidly to the size already specified. (*System of Surgery, Vol.* 2, *Chap.* 22.) Lassus has even seen a tumour of this description as large as a man's head. (*Pathologie Chir. Tom.* 1, *p.* 479.) Having treated particularly of the "aneurism by anastomosis," in another place (see *Aneurism*), I shall merely repeat the necessity there is for cutting every particle of the disease away, every portion of the congeries of vessels and cells of which it consists, whenever it is meddled with at all. Puncturing the swelling, or the partial removal of it, has cost many persons their lives by hemorrhage, as the records of surgery fully prove. (*Petit Traité des Maladies Chir. Tom.* 1; *Lassus, Pathologie Chir. Tom.* 1, *p.* 484, *&c.*)

Although the original causes of nævi are buried in obscurity, experience proves, that whatever produces irritation in the part affected, or an increased determination of blood to it, has generally the effect of accelerating the growth and enlargement of the swelling. Thus, a trifling bruise, or a tight hat, will sometimes excite a mere stain-like speck, or a minute livid tubercle, into that diseased action, which occasions its growth. (*Bateman's Pract. Synopsis, &c. p.* 327, *Edit.* 3.)

With regard to the treatment of nævi, the subject may be explained in a few words. When these marks, or swellings, are superficial, without any disposition to enlarge, or spread, and their trivial elevation does not expose them to accidental rupture, there appears to be no good reason for interfering with them. Indeed, they could only be destroyed with caustic, or the knife, and these severe means would leave scars, accompanied with nearly the same degree of disfigurement.

But, as a valuable writer observes, when nævi evince a tendency to enlarge, or are very prominent excrescences, and either troublesome from their situation, or liable to be ruptured, either their growth must be repressed by sedative applications, or the whole congeries of vessels extirpated with the knife. Mr. Abernethy has proposed the application of cold washes, and the pressure of a bandage. This practice was found by him in several instances to have the desired effect of checking the growth of the tumors, which afterwards shrunk, and became no longer objects of any consequence. (See *Abernethy's Surgical Works, Vol.* 2, *p.* 224.) Boyer also knew of a case, in which a nævus of the upper lip was cured by the mother pressing the part with her finger unremittingly for seven hours at a time, and the use of an alum wash. (*Traité des Maladies Chir. Tom.* 2, *p.* 269.) Boyer, however, is not generally an advocate for this mode of treatment; and Dr. Bateman expressly states, that, in the majority of cases, pressure is the source of great irritation to these maculæ, and cannot be employed. (*P.* 329.)

For all those examples, which partake of the nature of the aneurism by anastomosis, and are disposed to grow, the best general mode of cure is extirpation with the knife. The prudence of this practice, and the necessity of taking away every particle of the disease, has been already explained: this is what was advised by F. Hildanus; (*Cent.* 5, *Obs.* 46.) what was strongly urged by the celebrated Petit, (*Œuvres Posthumes, Tom.* 1.); what was recommended in still more animated terms by Mr. John Bell, (*Principles of Surgery, Discourse* 9;) and it is what is particularly insisted upon in another part of this Dictionary. See *Aneurism.*

In general, stimulating applications cannot be made to nævi, without risk of exasperating, instead of lessening them. Mere thickenings, and discolorations of the rete mucosum, however, have sometimes been removed by a mixture of spirit and the liquor potassæ. (*Bateman, p.* 330.)

Formerly caustic was much in vogue for the removal of nævi; but, unless its action extend deeply enough to destroy every part of the disease, it may cause a dangerous degree of irritation, copious hemorrhages, and a sudden and fatal enlargement of the tumor. Therefore, as it is a more painful measure than the knife, and less certain in its effects, it should be on every account discarded from practice. It cannot be denied, however, that the old surgeons had success with their caustics, where the nævi were altogether superficial. Thus, in speaking of caustic remedies, Callisen observes: "inter quæ eximio cum successu adhibetur sapo cum æquali parte calcis vivæ subtilissimæ commixtus, nævo per emplastrum perforatum admovendus, et alio emplastro imposito firmandus; hoc remedio eschara inuritur, qua soluta, cicatrix alba remanere solet." (*Syst. Chirurgiæ Hodiernæ, Vol.* 2, *p.* 202.)

Consult *Petit's Œuvres Posthumes, Tom.* 1; *Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 476, *&c. Edit.* 1809. *Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 201, *Hafniæ* 1800. *Abernethy's Surgical Works, Vol.* 2, *p.* 224, *&c. Latta's System of Surgery, Vol.* 2, *Chap.* 22. *J. Bell's Principles of Surgery, Vol.* 1, *Discourse* 9. *Boyer, Traité des Maladies Chirurgicales, Tom.* 2, *p.* 255, *&c. Paris* 1814. *A Practical Synopsis of Cutaneous Diseases by T. Bateman, M. D. Edit.* 3, 1814. *Delpech Précis Elémentaire des Maladies Chir. Tom.* 3, *p.* 244, *Paris* 1816.

**NECROSIS.** (from νεκροω, to destroy.) This word, the strict meaning of which is only mortification, is, by the general consent of surgeons, confined to this affection of the bones. It was first used in this particular sense, by the celebrated M. Louis, who restricted its application, however, to examples, in which the whole thickness of a bone was destroyed. (See *Mém. de l'Acad. Royale de Chirurgie, Tom.* 5, 4*to.*) By the ancients, the death of parts of bones was not distinguished from caries. However, necrosis and caries are essentially different; for, in the first, the affected part of the bone is deprived of the vital principle; but this is not the case when it is simply carious. Caries is very analogous to ulceration, while necrosis closely resembles mortification, of the soft parts.

Between caries and necrosis, says Weidmann, there is all that difference, which exists between ulcers and gangrene, or sphacelus, of the soft parts. In caries, the nutrition of the bone is only impaired, and an irregular action disunites the elements of the bony structure, which consequently sustains a loss of substance; but, every remaining part of it is yet alive. In necrosis, on the contrary, the vitality and nutritive functions cease altogether in a certain portion of the bone, the separation of which then becomes indispensable. (*De Necrosi Ossium, p.* 7.)

I have mentioned, that M. Louis confined the term necrosis to cases, in which the whole thickness of a bone perished; but, Weidmann judiciously criticises this limitation of the word, and maintains, that the nature of the disorder is the same, whether it affect a single scale, the whole, or a mere point, of the bone. He also objects to the definition of necrosis proposed by Chopart (*Dissert. de Necrosi Ossium, Paris* 1766), and adopted by David. (*Obs. sur une Maladie connue sous le nom de Nécrose, Paris* 1782.) These two authors have defined necrosis to be a disorder, in which a portion of bone perishes, and turns dry, in order to be soon separated from the living parts, and replaced by a new bony substance, which is to perform its functions. But, as Weidmann observes, it may happen, that a piece of bone, which dies and separates, may not be replaced by any new formation of bone, though the disease is of the same character, and merely varies in some modifications. He therefore argues, and every rational surgeon will agree with him, that a true necrosis must always be said to exist, whenever a dead portion of bone has either separated, or is about to separate. "*Vera demum necrosis semper est, si aliquod ossis ramentum, in quo vis vitæ extincta est, abscessit, vel proxime abscessurum, est.*" (*P.* 7.)

The tibia, femur, lower jaw, clavicle, humerus, fibula, radius, and ulna, are the bones most frequently affected with necrosis. Excepting the lower jaw and scapula, the process of regeneration has only been noticed, in the cylindrical bones. From 12 to 18 years of age, is the time of life, most subject to necrosis. The necrosis of the lower jaw, however, seldom occurs before the age of 30. In some persons, two bones are affected at once, owing to constitutional causes.

No climate, age, sex, mode of life, nor condition, (says Weidmann) is exempt from the disorder. Childhood and puberty, however, are the periods most liable to it. The same thing may be said of persons, who labour hard, and are much exposed to external injuries. Every bone of the human body is subject to necrosis; but, those which are superficial, and enter into the formation of the extremities, are more frequently affected, than others whose situation is deeper. Necrosis less commonly attacks the spongy substance of the bones, because this being indued with a higher degree of vascularity and life, suppuration is most apt to occur. Necrosis, on the contrary, is oftener seen in the compact substance, where the vital principle is less energetic, and more readily extinguished. Lastly, the disorder may affect the long bones, or the broad; the large or small; and even those of the very least size; since it is well known, that the ossicula of the ear may be destroyed by necrosis, and separate. I have seen this happen in two instances, and the fact is recorded by several writers. (See *Astruc de Morbis Venereis, lib.* 4. *cap.* 1. *Henri, Journal de Médecine, Tom.* 15, *p.* 363.)

Though necrosis mostly attacks the cylindrical bones, the flat ones are not exempt from the disease. Pott makes mention of a parietal bone, the whole of which was detached, and of an os frontis, the greatest part of which came away. In a thesis on necrosis, in 1776, *aux écoles de chirurgie*, may be found the case of a young man, a very large part of whose scapula perished and separated. Chopart, who relates the case, mentions, that he saw the patient quite recovered, and felt a new triangular moveable bone, firmly supporting the clavicle, but, smaller and flatter, than natural, and without any spinous process. The same has happened to the lower jaw, as may be seen by referring to the *Ephemerides Germaniæ*, and *Mem. de l'Acad. de Chirurgie.* In the fifth volume of the latter work, is an account of a woman, who applied to be relieved of some venereal complaints. From the beginning of the treatment, the bone was discovered to be loose just under the gums, and seemed, shortly afterwards, to move backwards and forwards with a tooth. M. Guernery took hold of the tooth with a key-instrument, and found it firmly inserted in the moveable piece of the jaw; he made with caution the necessary manœuvres for extracting the portion of bone; but was greatly surprised on finding what an extensive part yielded to his very moderate efforts. It was the whole of the lower jaw, above its right angle, from its division into the coronoid and condyloid processes to the space between the first and second of the front grinders of the left side. On the right, there only remained the condyle in the articular cavity of the temporal bone. This destruction left a considerable empty space, from which great deformity was apprehended, in consequence of the unsupported soft parts falling down. The woman, however, got well in two months, and had the most perfect use of a new jaw. A similar fact is recorded in the *Journal de Medecine*, 1791.

When the body of a cylindrical bone, or the middle portion of a flat bone, is destroyed by necrosis, their extremities, which are of a cellular texture, continue unaffected, so that, for example, in the cylindrical bones, the articular ends are always formed of portions of the original bone, which are engrafted, as it were, on the new production. There are, however, a few bad cases, in which the necrosis does not altogether spare the heads of the bones, and the disease communicates with the joint. These examples are very uncommon, and are attended with considerable danger to the limb: indeed, they generally require amputation. (See *Boyer, Traité des Mal. Chir. T.* 3, *p.* 442.)

Besides the differences arising from the particular bones affected, necrosis also varies, according as the portion of bone attacked happens to be thin and of little extent, or large and of considerable thickness. The disease is *simple*, when it is confined to one bone, and the patient is in other respects healthy; *compound*, when several different parts of the same bone, or several distinct bones, are affected at the same time; when the health is bad; and other parts of the body are also diseased. It should also be known, because the information is of practical importance in the treatment, that necrosis has three different stages, or periods. In the first, the bone affected perishes; in the second, the process of exfoliation, or separation of the dead bone from the living, is going on; and, in the third, the separation is completed. (See *Weidmann, p.* 8.)

The causes of necrosis are not essentially different from those, which produce ulcers and gangrene of the soft parts. As, however, the vitality of the bones is weaker, we may infer, that necrosis may be occasioned in them by causes, which are less numerous and intense, and such as would only give rise to suppuration in the soft parts. Every thing, whether in the periosteum, or the substance of the bone, itself, that tends to interrupt the nutrition of the bone, must be regarded as conducive to the origin of necrosis. It is to be observed, however, that when the mischief in the periosteum, medulla, or substance of the bone, is of trivial extent, the consequence is merely an abscess. Some of the causes of necrosis are *external*, while others are *internal*, or constitutional. Sometimes the life of the bone is instantaneously destroyed by them; but, in other instances, the bone is first stimulated and enlarged, so that its death is preceded by true inflammation.

The external causes, which injure the periosteum, and medullary structure, and thus produce necrosis, are wounds, contusions, pressure, fractures, comminutions, acrid substances, caustics, and extreme degrees of heat, or cold.

When the periosteum, in consequence of an external cause, inflames and sloughs, or is at once deprived of its vitality, as it may be by the action of caustic, fire, or intense cold, the vessels, which conveyed nourishment to the bone, are destroyed, and the death and exfoliation of the denuded portion of the bone are inevitable. But, if the detachment of the periosteum is of little extent, the patient young and healthy, and the treatment calculated to prevent inflammation, and preserve uninjured the vessels distributed to the bone, hopes may be entertained that no part of the bone will die, but that granulations will very soon arise from its surface, being adherent to it as the periosteum was, and that they will grow to and cicatrize with the surrounding parts. Weidmann has explained, that this fact of bones not always exfoliating when deprived of the periosteum, which is of great practical importance in the treatment of wounds, was inculcated by Felix Würz, Cæsar Magatus, and Belloste, at a time when the contrary opinion prevailed. Weidmann also adverts to his own experience and to the experiments of Tenon, in further proof of the preceding fact. (*Mém. de l' Acad. des Sciences*, 1758, *p.* 372.)

On the other hand, when the detached piece of the periosteum is extensive; when the bone itself is contused; or when it has been long exposed to the air, the effect of which is to dry up the few vessels, which belong to it; when the inflammation is violent and extensive; when the patient is old, decrepid, or of bad constitution; and, more especially, when improper applications are used, as was almost always the case in former times; necrosis cannot be avoided.

An internal necrosis, affecting the spongy texture of bones, generally arises from constitutional causes, though, sometimes an external cause, which seems to affect only the surface of a bone, extends its action to the interior, so as to destroy the medullary membrane, and produce an internal necrosis.

In external injuries of the head, where the pericranium is lacerated, contused, or otherwise hurt, or where the outer table, or the diploe, of the skull, is injured, the inflammation frequently extends to the inner table, and the dura mater becomes detached. Hence, a collection of matter forms, which may occasion many bad symptoms, and even death itself; or, if the patient survive, an exfoliation of part of both tables of the skull is the consequence. (See *Pott's Chirurgical Works. London*, 1779, *Vol.* 1, *p.* 32.)

The same thing may occur in other bones, as well as those of the cranium. Bromfield had an opportunity of seeing a necrosis of the spongy substance of the upper and internal part of the tibia, brought on by the improper mode, in which an issue was dressed. In order to keep the peas from slipping out of their places, a compress with a shilling in it, and a tight bandage were applied; but, the part was attacked with excruciating pain, and the spongy texture of the tibia in the vicinity became affected with necrosis. (*Chirurgical Observations and Cases, Vol.* 2, *p.* 9.)

This circumstance, as Weidmann observes, ought not to surprise us: as numerous vessels quit the periosteum to descend into the substance of the bone, to ramify on the medullary cells themselves, and freely anastomose there, it cannot be difficult to conceive, how inflammation, which is at first confined to the outside of the bone, may (through the medium of the vessels, which serve as conductors to it) penetrate more deeply, and extend its ravages in every direction.

But, necrosis may proceed from another description of causes, which are of a constitutional nature. In fevers of bad type, in the small pox, and in the measles, experience has fully proved, that the bones are sometimes attacked with necrosis. Scrofula, lues venerea, and the scurvy, are also diseases, which, according to the testimony of all surgical writers, frequently produce such mischief in the bones as terminates in necrosis. It is likewise well ascertained, that mercury, the judicious employment of which in venereal cases will prevent necrosis, or cure them when formed, may itself give rise to the disorder, especially in the lower jawbone. (See *Mém. de l'Acad. de Chir. t.* 5, *p.* 356. 4to.)

This happens either in consequence of mercury having been introduced too quickly into the system, or because the patient exposes himself to cold, or deviates in some other respect from a proper regimen. Certain necroses of the lower jaw, however, appear also to have been caused by blows, and the application of acrid substances to carious teeth. But, says Weidmann, "I feel it incumbent upon me particularly to declare, that the irrational treatment pursued by the ancient practitioners, who neither understood the nature of the bones, nor the differences of their diseases, and which treatment is too confidently adopted in our own days, had frequently the effect of killing these parts, by attacking with spirituous, acrid, or caustic remedies, or even with the knife, diseases, which required the mildest applications, and to be left in a great measure to nature. The old surgeons were afraid of laying on the exposed injured surface of a bone unctuous emollient dressings, and, yet, for what reason I know not, they subjected the part to the action of spirituous acrid drying applications. As for myself, I deem it proved by infallible and frequently repeated trials, not only that an exposed injured bone may be dressed with a mild ointment without any ill consequences, but even with the greatest advantage. Why, should that, which is beneficial to the soft parts, be so prejudicial to the bones? In ulcers of the soft parts, indeed, the employment of the remedy, which I recommend, is less important, because these parts are naturally humid, and there is no risk of their becoming dry. But, with regard to the bones, whose dry texture is only penetrated by few vessels, which may easily be destroyed if they be suffered to become quite dry, it is absolutely necessary to use an emollient ointment, as a dressing, well calculated to defend these vessels, which are the support of life, and preserve them from the bad effects of exposure to the air. Therefore, observes Weidmann, if a surgeon would avoid producing a necrosis himself, and not neglect any means, that tend to prevent such disorder, *he should make it a rule never to apply any thing acrid to exposed bones, but, on* *the contrary, to defend them with a dressing of some unirritating ointment.*" (*De Necrosi Ossium, p.* 11.)

It was formerly supposed, that purulent matter, collected near a bone, might in time become acrimonious, corrode the bone, and produce necrosis. Hence, it was a rule to open such an abscess as soon as its existence was known. But, Weidmann questions, whether there was any real necessity for this practice. No doubt, says he, the preceding erroneous opinion arose from the circumstance of the bones being often found bare, carious, or even affected with necrosis, when abscesses were near them; but, things happened thus, because the inflammation, which caused the suppuration, had also extended its effects to the periosteum and bone. He affirms, that he has witnessed ulcers, in which the surfaces of bones, bare and uncovered by the periosteum, lay bathed in pus for a very considerable time; yet, being dressed with a mild ointment, they continued entire, granulations grew from them, and cicatrization followed. He had also in his possession portions of bones affected with necrosis, which had lain for years in pus; still their surface was smooth, and presented no marks of erosion. If then these pieces of bone underwent no alteration, how much less likely to do so are bones, which are endued with life!

But, though Weidmann wisely rejects the doctrine of pus being capable of destroying the periosteum and bones by any corrosive qualities, he acknowledges his belief, that the matter of an abscess may by its quantity compress and inflame the adjacent parts, and occasion their removal by the absorbents. While the periosteum intervenes between an abscess and the bone, he does not see how the latter can be hurt by the pus; but, when the abscess is copious and lodged between that membrane and the bone, the vessels passing from the former will be destroyed, and either caries, or necrosis ensue.

The inflammation, arising from the causes which excite necrosis, may be either *acute*, or *chronic*. It is chronic, when it begins and passes through its different stages slowly, and when the mildness of the symptoms may lead us to mistake the nature of the case. This sort of inflammation chiefly happens in debilitated constitutions, in which the necrosis only affects the external part of a bone, and originates from some chronic cause, such as scrofula, lues venerea, and the scurvy. But, when necrosis attacks the interior, and the disease occurs in a strong, irritable, plethoric subject, inflammation is immediately kindled, attended with the most acute symptoms, severe pain, considerable fever, restlessness, delirium, &c. Chronic inflammation is more supportable; but its duration is longer: acute inflammation is more afflicting, but sooner comes to a crisis.

The part, in which a necrosis is situated, is affected with swelling. What has been observed, respecting the inflammation, is also applicable to this tumour, which most frequently forms gradually, but sometimes with great rapidity. In the first case, the accompanying pain is dull and inconsiderable; in the second, it is violent. The swelling has not, like that of abscesses, an elevated apex. On the contrary, it is so widely diffused, that the limits, which circumscribe it, can hardly be distinguished.

This diffusion of the swelling is the greater, in proportion as the diseased bone is more deeply buried in soft parts: it may extend over the whole morbid bone, or even over the whole limb.

The swelling comes on at the very beginning of the disorder, and continues to increase, until the matter which it contains finds its way out, when the evacuation is followed by a partial subsidence of the tumour. The swelling is sometimes also combined with œdema, especially in persons, whose constitutions have been impaired by the severity of the disease, the violence of the sufferings, and the long and profuse discharge.

When the inflammation is acute, purulent matter of good quality soon collects in the vicinity of the necrosis. In the contrary case, the pus forms slowly, and is thinner and less healthy.

The abscess, which accompanies a necrosis, naturally soon bursts when it arises from intense inflammation, and is situated near the skin, which is itself inflamed. But, when the bone is surrounded by a great thickness of soft parts, and the inflammation is chronic, the quantity of matter daily increases, the cavity, which it occupies, becomes larger and larger, and considerable pressure is made by the abscess on every side. The bones and tendons resist for a long while the progress of the matter; but, the cellular substance yields, and different sinuses form, which sometimes run to a vast distance from the main collection of matter, especially, when the abscess lies under an aponeurosis.

It was supposed a few years ago, that, in cases of necrosis, the matter was invariably sanious, acrid, and fetid. But, the celebrated Weidmann exposed the error of this opinion. He had often seen abscesses and ulcers, arising from necrosis, discharge a whitish, inodorous, thick pus, absolutely devoid of any bad quality whatsoever. He had particularly seen this happen in patients, whose necroses proceeded from an external cause, or an internal one of a slight nature, and whose health was generally good. (*De Necrosi Ossium, p.* 16.) If, says the same excellent writer, we sometimes find in practice the suppuration dark and fetid, we must not ascribe it to the affection of the bone; but to the weakness and bad state of the patient's health. Under the same circumstances, common sores of the soft parts would also emit a discharge of bad quality.

After the ulcerated openings have emitted for some time a profuse discharge, the sinuses, if considerable, receive the appellation of fistulæ, on account of their edges putting on a callous appearance, throwing out fungous granulations, and there being impediments to cicatrization. These impediments are caused by the dead portions of bone, which, whether loose, or adherent, act as extraneous bodies in hindering the sores from healing. In some instances, also, the ulcers will not heal, though the dead bone has come away, because they run to a great depth, and such a quantity of pus is secreted from every point of their surface, as prevents all contact, and the adhesions, which would result from it.

The fistulæ vary in number; but, they are fewer in proportion as the disease is slighter. In an extensive necrosis, several of these openings are seen, either near together, or separated by considerable spaces; and, when the necrosis affects every side of the bone, the fistulæ in the integuments occur on every side of the limb.

Besides the inflammatory fever, which attends the beginning of every severe case of necrosis, which is sometimes accompanied with exceedingly violent symptoms, and which usually abates when the matter is formed, the patient is subject to another fever of a slow hectic type. This takes place in the decline of the disease, is the effect of the long continued profuse suppuration, gradually reduces the patient, and at length brings him to the grave, unless the timely removal of the sequestrum be effected either by nature, or art.

Let us next endeavour to trace the signs, by which we may not only ascertain the presence of the disease, but its modifications.

In the first place, we should make ourselves acquainted with every thing, which may have predisposed to the disorder; as, for instance, what accidental circumstances have occurred, and what symptoms followed them. We should also enquire into any previous treatment, which may have been adopted; for, as Weidmann truly remarks, injudicious remedies have caused many a necrosis, that would not have occurred at all, if the case had been properly treated, or confided to nature.

The kind of inflammation, with which the disease commences, may afford grounds for suspecting that necrosis will happen: it is generally slow and deeply seated, passing through its stages tardily, and the attendant symptoms are severe. The skin retains its natural colour a long while; but, at length, exhibits a reddish, or livid discoloration. The matter does not reach the skin, till a considerable time has elapsed, and when the abscess bursts, the inflammatory symptoms are still slow in subsiding. When the inflammation is acute, the patient suffers intolerable pain a long time.

There are also other symptoms of a necrosis; viz. the swelling, which accompanies the inflammation, is situated upon a bone, or rather the bone is included in the tumour; the swelling is at the same time very diffused; and the suppuration lies deeply, and can only be felt in an obscure way.

The ulcers, beneath which a necrosis is situated, discharge a large quantity of matter, and their edges are bent inward. The granulations are either yellowish and pale, or else of an intense red colour; and they are also irregular, and generally not very tender, though sometimes extremely painful, and on being slightly touched, they bleed.

It has been already noticed, that, some years ago, the discharge from the sores, which attend necrosis, was described as being always thin, fetid, and sanious; and such qualities of the matter were regarded as a symptom of the disease of the bone. But, that excellent practical writer Weidmann has well explained, that it is a symptom, undeserving of confidence. In cases of necrosis the pus is often thick, white, and inodorous; while other ulcers, unattended with diseased bone, sometimes discharge thin, fetid matter. Weidmann, at the same time does not mean to assert, that, in cases of necrosis, the sores never emit unhealthy pus; but, he firmly believes, that such discharge is not always the result of a disease of the bone. As far as he could judge, the suppuration from ulcers, situated over diseased bones, continues white and laudable, as long as the patient's general health is good; but, that it deviates from these properties, in proportion as the health becomes impaired.

Neither is the black colour, imparted to the dressings of ulcers, a circumstance, which necessarily indicates the existence of necrosis; for, it may occur, when the bone is sound, and may not happen, when the bone is affected.

None of the preceding symptoms convey such information, as leaves no doubt of the positive existence of necrosis. The touch is the only thing, which can give us this knowledge, when the bone is not too deeply situated, and the sinuses not tortuous, nor obstructed with fungous growths.

When the openings of the ulcers are

considerable, the finger may be introduced. If, in this way, the bone can be felt to be extensively uncovered by the periosteum, the surgeon may conclude, that all such portion of the bone has perished. He may be still more certain of the fact, when he finds the edges of the denuded bone unequal and rough.

The examinations, made directly with the finger, give the most correct and exact information of the state of the bone; but, the orifices of the sores are sometimes so small, that the finger cannot be introduced, without causing great pain. A probe must then be used for the purpose of ascertaining the extent of the denudation of the bone; whether its edges are rough; whether the dead portion is loose, and likely to separate soon.

Sometimes, the dead fragment of bone protrudes from the ulcer, or is visible on separating its edges. When it is black, there cannot be a doubt of its being actually dead; but, on the other hand, when its whiteness is increased, the diagnosis is difficult, because bones being naturally white, much experience is necessary to be able to judge whether they are so in excess.

It merits attention, also, that the black colour of the bone is not owing to the necrosis itself, but seems rather to depend upon the fragment having been exposed to the air. In fact, dead pieces of bone with which the air comes into contact, turn black, while those, which are covered with matter, retain their whiteness. The cylindrical portion of a humerus, which was almost totally affected with necrosis, was universally black at the part, which protruded through the flesh; but the rest, which lay under the integuments, remained white. (*Weidmann de Necrosi Ossium, p.* 19, *et Tab.* 9. *fig.* 1.)

When the early symptoms of the disease are mild, the surgeon may infer, that it is only a superficial portion of the bone, which is about to be separated. But, this judgment will be more certain, if confirmed by examination with the finger, or probe; or if the swelling, which occurred in the beginning, has not spread beyond the affected point, and if the pain affects only the outer part of the bone. In this sort of case, there is also great probability, that the dead bone will be separated within a moderate time.

It is also of importance to ascertain the existence of an internal necrosis, and to learn, whether it is situated in the spongy substance, or in the internal parietes of the canal of the bone; whether it affects only a part, or extends to the whole body of the bone. When there is an internal necrosis, says Weidmann, the disease is generally more aggravated, and of longer duration; and, in the first stage, the patient is affected with severe symptoms, intolerable pain, loss of rest, ardent fever, profuse perspirations, and such disorder of the system, as may prove fatal, unless the patient be young and strong. The hard swelling, which was observable at the commencement of the disease, increases but slowly, and extends very gradually over the circumference of the limb, while the skin yet remains free from redness and tension. *If the part be somewhat roughly handled, the pain, which is fixed in the bone, is not rendered more acute, as would happen, were the case an external inflammation.* In this suffering condition, the patient continues a good while, before the formation of matter brings a degree of relief. When the matter is formed, it spreads through the adjacent cellular substance, amongst the muscles and other parts, and the abscess generally bursts, after a considerable time, by several openings, very distant from the main collection of matter, and also remote from each other, sometimes in diametrically opposite situations. The evacuation of the matter, however, does not produce any material subsidence of the swelling. The pus is of good quality, and issues in large quantities from the ulcerated apertures, *the quantity, however, not being increased when pressure is made.* If some of the openings heal, others are formed; but, in general, their edges become callous, and they lose all disposition to cicatrize. When the case presents the foregoing circumstances, and the weakened limb can neither bear the action of the muscles, nor the weight of the body, and by either of these causes, its shape becomes altered, the surgeon may conclude, that the disease is an internal necrosis. But, in order to avoid mistake, he should introduce into the sinuses, a probe, which, passing through the openings in the subjacent bone, will touch the dead piece, which it contains, and which will sometimes be even distinguished to be loose and moveable. *The extent of the sequestrum must be judged of, by the extent of the swelling, and the distances between the apertures in the bony shell, which includes the sequestrum.*

The surgeon should also endeavour to ascertain with the probe, whether there is only a single sequestrum, or several. When there are several, they may be felt with the probe in different places, down to which this instrument is passed, and the removal of one, or two of the fragments, is not followed by a cure. It ought to be remembered, however, that the same fragment may be touched by the probe in several different places, when it is very extensive. If there are several dead pieces of bone, situated at a distance from each other, each of them is generally accompanied with a distinct swelling, and sinuses. Frequently, these fragments are so concealed, that they cannot be felt with a probe; but, their existence may then be suspected from the ulcers not healing, which can be ascribed to nothing else.

It is also necessary to distinguish with the greatest attention the different stages of the disease. The *first stage* may be considered as existing, when the attack is yet recent, and the inflammation and its concomitant symptoms, the pain, swelling, and symptomatic fever, prevail in a high degree, and when no suppuration has taken place, or at least no discharge of matter. The *second period,* in which the dead bone is undergoing the process of separation, is indicated by a diminution of the inflammation, a partial subsidence of the swelling, and the discharge of purulent matter. When a probe is passed into the ulcers, the bone is felt bare, and dry, and, towards the limits of the swelling, it is rough, where as will be afterwards noticed an excavation is formed. Every part of the bone, however, which is to be detached, still continues adherent to the rest of the living bone. At length, the surgeon knows, that the disease has reached its *last stage,* or that, in which the dead portion of bone, is entirely separated, when sufficient time for the completion of this separation has expired, and when the dead bone can be distinguished with the finger, probe, or even the eye, to be loose and free from all connexions.

Although a necrosis must generally be classed with diseases which are serious and of long duration; yet, the character of the disorder is not essentially bad, since it is often cured by nature, or with the assistance of surgery. Confident hopes of a cure may be entertained, when the necrosis is confined to the external part of a bone; when it is simple and of moderate extent; when it is not situated in a bone, destined for important uses, or near any viscus, or organ, that may be injured by it; and when it proceeds from an external cause, and the general health is good. On the contrary, the cure is difficult, and the prognosis doubtful, when the disease is extensive, and complicated with other affections, either of the same, or different bones; when it attacks bones, which are of high importance on account of their functions, or situation; when it is situated in the interior of a bone, and affects several parts of it; when it arises from an internal cause, for which there is no certain and quick-acting specific; when the patient is weakened by age, or disease; and, especially, when the sinuses extend into the neighbouring articulations. (*Weidmann de Necrosi Ossium, p.* 22.)

The process of cure is said to take place with more celerity in the lower jaw, than any other bone, and may be completed in three months. Mr. Russell has never known a necrosis of the tibia get well in less than a year; but, in general, nearly two years elapse first; sometimes, the cure is protracted to a much greater length of time.

Necrosis of the lower jaw and clavicle never proves fatal: that of the lower extremities, which is the worst case, does so very seldom, and only, from the violence of the first inflammatory symptoms, which rapidly bring on a hectic fever, which proves incurable, unless its local cause be removed by a timely amputation. When the violence of the first stage, however, has abated, the irritation ceases, and the hectic symptoms, if there are any, are generally moderate. Nor is this state of tranquillity disturbed, till the sequestrum, in making its way outward, again produces irritation. At this second period of urgency, extensive inflammation may originate, ulcerations spread all over the surface of the limb, assume an unhealthy appearance, violent fever succeed, and the patient either perish, or sink into a state, in which he must consent to amputation, as the only means of saving his life. This is the last crisis of eminent danger; but, in general it is less perilous, than when the inflammation comes on in the incipient stage of necrosis. (*Russell.*)

In the treatment of necrosis, the first grand object of the surgeon should be to aid nature in her endeavours to effect a cure, and not to disturb her operations by any superfluous, or unseasonable interference. The second should be to assist her sometimes by the boldest proceedings, when she loses her way, and cannot by herself accomplish the end.

But, in order not to attempt any thing wrong, the surgeon must understand correctly what nature does in this disease, what it is in her power to perform; what she either cannot accomplish at all, or not with any degree of certainty; and lastly the circumstances, in which she may err, and endanger the patient's life.

When a portion of bone dies, nature uses all her endeavours to bring about its separation from the part of the bone, which still remains alive. Surgeons have denominated this process, *exfoliation,* (See *this word*), which resembles the separation, that occurs between parts affected with gangrene and sphacelus, and the living flesh. An exfoliation of bone, however, happens much more slowly, than the separation of a slough of the soft parts. Neither are all exfoliations completed at a regular period; for, they proceed most quickly during youth, when the constitution is usually more full of energy, the bones more vascular, and less replete with solid inorganic earthy matter. On the other hand, the process is slower, in old, debilitated subjects, whose vitality is less active. A thin, small scale of bone separates sooner, than a large thick portion; and the most tedious exfoliation is that of a thick bone, from which a portion, including its entire diameter, is coming away. The separation of a necrosis takes place more expeditiously in bones of a light texture, than in those of a solid structure; and sooner, in the less compact parts of bones, such as the epiphyses and spongy substance, than in those of greater density.

When a necrosis has originated from the scurvy, syphilis, &c. and appropriate remedies are not administered, nature cannot effectually accomplish the process, by which the dead bone is separated; the case becomes worse; and life endangered.

The separation happens precisely at the different points where the living and dead parts of the bone come into contact; and it is obvious, that the particles of the dead bone, which are at a distance from the part, that retains its vitality, cannot be acted upon by it.

A variety of opinions have been entertained, concerning the means employed by nature in effecting this separation. Hippocrates believed, that the dead part was pushed away by a fleshy substance, which grew underneath it. (*De Cap. vuln. Cap.* xxiv.) Ludwig, Aitken, Bonn, and many others, adopted the same idea. (See *Adversaria Med. Pract. Vol.* 3, *p.* 63; *Systematic Elements of the Theory and Practice in Surgery, p.* 287; *Thesaur. Oss. Morb. p.* 1.)

Van Swieten conceived, that the dead part was forced away by the incessant beating of the arteries. (*Comment. in Aphor. Boerrhavii*, § 252.) M. Fabre ascribed the separation to the extension and expansion of the vessels. (*Mém. de l'Acad. de Chir. Tom.* 4, *p.* 91.) Others supposed that the exfoliating piece of bone became loosened partly by the suppuration, and partly by the rising of the new granulations. (See *B. Bell on Ulcers.*)

As Weidmann observes, there is unquestionably a reddish fleshy substance formed between the dead and living bone, and which Celsus has noticed under the appellation of caruncula. (*De Medicina, lib.* 8. *cap.* 3.) But, it would be erroneous to refer the expulsion of the dead portion of bone to it, since it can never be produced, before a change has taken place in the structure of bone, there being in fact no space for it to grow in; and hence, it is never seen before the disunion of the parts has considerably advanced. There must consequently be some other power, which destroys the cohesion between the dead and living bone, and produces the groove, or interspace, in which the soft granulations arise. Besides, amongst other facts proving the falsity of the idea, that the granulations push off the dead bone, Weidmann particularly adverts to the occasional exfoliations of the whole circumference of a cylindrical bone. Here, if the granulations had the power of causing a disunion on one side, they could not have the same effect on the opposite one; but, would tend to make the contact more intimate.

The separation also cannot be made by the pulsation of the small arteries, nor by the weak expansive motion of the vessels of the bone. Weidmann knows not what motives have induced certain writers to impute the effect to suppuration, and observes, that, as the doctrine is not founded upon reasoning, it is superfluous to offer any arguments against it. If the least attention be paid to what nature really tries and accomplishes in this operation, nothing will be more manifest, than that it is completed in a very different manner. Swelling first affects the periosteum and bone, which by degrees softens. (*Vid. Troja passim. Bonn. Thesaur. Oss. Morbos, p.* 122, *and Weidmann de Necrosi Ossium, Tab.* 4. *Fig.* 1 *and* 3.) At the margins of the necrosis, the bony surfaces, which were smooth, become rough, and irregular. A fissure is there produced, which extends in every direction under the piece of bone, that is about to be detached. The bony texture is also daily rendered less solid, so that the number of adhesions between the dead and living parts diminish, and in the end are totally destroyed. Weidmann then explains, that the true mode by which the separation is effected, consists in the absorption of the particles, situated betwixt the living and dead parts of the bone, in such a way, however, that the first loses a great deal of its substance; the last, scarcely any thing. (*P.* 25.) After the dead bone has come away, the swelling of the periosteum subsides, and the living bone recovers its original hardness and solidity. (*Troja, p.* 67.)

For a further account of the process, by which dead portions of bone are separated from the living, see *Exfoliation.*

When dead portions of bone are separated and loose, they still lodge in the cavities of the ulcers, and, like all other extraneous bodies, occasion irritation of the soft parts, and keep up a discharge of matter. Sometimes, however, nature of herself succeeds in expelling them. This happens in cases, where the size and shape of the ulcer are calculated to facilitate the issue of the dead bone, which does not lie too deeply, and is propelled outward by its own weight. In necroses of trivial size, indeed, it is asserted, that the small fragments of bone may be dissolved in the pus, and come away with it; (*David; Bousselin, Hist. de la Societé Royale de Médecine, Tom.* 4, *p.* 308; *Weidmann de Necrosi Ossium, p.* 26.) but, such an event can never be expected when the dead portion of bone is at all extensive.

The last thing, which nature does, is to restore the loss of substance which the bone has suffered. Although this operation is so extraordinary, and wonderful, that one might be disposed to doubt its reality, numerous examples, recorded in the annals of surgery, prove not only its possibility, but, also, its frequency.

In works, referred to at the conclusion of this article, the following authors speak of the regeneration of a part, or the whole of the lower jaw-bone: viz. Bonetus, Bayer, Guernery, Belmain, Acrel, Van Wy, Trioen, Bonn, Reiplein, Desault, Henkel, and Dussaussoir. A student shewed Weidmann a lower jaw-bone, which had been thus regenerated, and taken from the body of a man, whom the latter distinguished writer had been well acquainted with. The bone could not be freely depressed; but, yet, it performed its functions tolerably well.

Moreau saw a case, in which the clavicle was regenerated, and the new bone was presented by Dangerville, after the patient's decease, to the Academy of Surgery at Paris. (*De Necrosi Ossium Theses, Præs. F. Chopart, resp. P. G. Robert, Parisiis,* 1776.)

Chopart had an opportunity of witnessing the death and reproduction of a scapula.

Weidmann saw an instance, in which nearly the whole cylindrical shaft of the humerus perished, and was afterwards regenerated; a phenomenon, that had been observed at earlier periods by Job of Mekren, Cajetano Taconi, E. Blancard, Duhamel, David, Acrel, Bœhmer, Cheselden, and Vigaroux, whose respective works are cited at the end of this article.

Morand, Cheselden, and Bromfield published engravings, representing a reproduction of the upper part of the humerus, where the old dead bone was included in a sort of bony tube.

Regenerations of the ulna have been observed by Ruysch, Duverney, and Fowles. (See *Thesaur. X. No.* 176; *Traité des Mal. des Os. Paris*, 1751; and *Phil. Trans. No.* 312.)

A similar reproduction of the lower ends of the radius and ulna was witnessed by Acrel. (*Chirurgische Vorfälle von Murray, Vol.* 1, *p.* 194.)

Similar reproductions of the thigh-bone are recorded by Wedel, Battus, Koschius, Hofmann, Scultetus, Diemerbroeck, Wright, Fabricius Hildanus, Raw, Dobyns, Mackenzie, Ludwig, David, Rousselin, Larrey, Hutchison, &c. in publications specified at the conclusion of this subject.

The following case of necrosis of the thigh-bone is related by Dr. Mackenzie.—William Baxter, a boy thirteen years old, received a blow on his thigh at school, of which he at first hardly complained; but, in a few months, he began to have pain in the thigh, which inflamed, swelled, and appeared to have matter in it. The parents being poor, no surgeon was called, and the boy was allowed to linger for a great while. At length the matter made its way through the skin, by a small opening, on the interior part of the thigh, about three inches above the knee, and a thin sanies continued to be discharged for eighteen, or twenty months. At length, the hole in the skin enlarged, and the point of a bone began to protrude, and give a good deal of pain, when the clothes rubbed against it. After suffering in this manner for two years and a half, the boy, as he lay in bed one morning, felt the bone looser, and projecting more, than ordinary. He gave it a strong pull, and brought the piece away entirely, which proved to be seven inches and a half of the thigh-bone. A good deal of bleeding followed; but, the wound soon healed, and he has never since found the least inconvenience. Dr. Mackenzie, hearing of this singular case, sent for the boy, carefully examined his thigh, and found it as firm as the other. The only difference was, that it was somewhat thicker, and a little more curved. The muscles retained their natural softness, and looseness on the bone. The detached piece of bone was a portion of its whole circumference. (See *Med. Obs. and Inquiries, Vol.* 2.)

We may infer, that the occurrence is more frequent in the tibia, than any other bone, from the accumulated facts, mentioned by Albucasis, La Marche, Muralto, De la Motte, Ellinchuys, Ruysch, Tacconi, Laing, Johnson, Hunter, David, Boehmer, Sigwart, Th. Bartholine, Hofmann, Saviard, Le Dran, Duverney, Trioen, Gunther, Ludwig, Michael, Bousselin, Weidmann, Russell, Whately, Desault, &c. See the works referred to at the end.

Dr. Hunter mentions a tibia, which was sent to him by a Mr. Inett, after amputation. On examination, the case at first sight seemed to be a swelling of the whole bone, with a loose internal exfoliation. However, it proved to be a remarkable instance of the separation of the greatest part of the original bone whose place was supplied by a callus. The external surface of the inclosed loose piece of bone was smooth. A small part of the surrounding bony substance being removed, the contained piece was taken out, and found to be the whole body of the tibia. It had separated from the epiphysis at each extremity. The middle part of the bone had perished, consequently, had lost its connexion with the periosteum, and was gradually thrown off from the living parts of the bone at each end. A callus extended from end to end, united the two extremities of the original tibia, preserved the length, and gave firmness and inflexibility to the part. The exfoliation was so encompassed by the new bony case, that, though quite loose, it could not be thrown out. (*Med. Obs. and Enq. Vol.* 2.)

Weidmann saw a shoe-maker, who, after much suffering, extracted himself the greatest part of the diaphysis of the tibia; yet, the loss was so well repaired, that the man could walk afterwards nearly as ably as ever. (*De Necrosi Ossium, p.* 29.)

"We are not to imagine, (says Weidmann,) that these regenerations happen by chance: experiments made upon living animals by Troja, Blumenbach, Koehler, Desault, and myself, prove, that they invariably follow certain laws."

In fact, whenever the medullary structure of the long bones of pigeons, or dogs, is destroyed, these bones become affected with necrosis, and are afterwards reproduced to the full extent of their destruction.

The observations and experiments, cited by Weidmann, also prove, that it is the long bones which are usually reproduced; though the flat ones are not entirely destitute of the power of regeneration, since experience fully evinces, that, when a portion of the skull is removed, either by a wound, by disease, or by the trepan, nature always endeavours to cover the deficiency, the edges of the aperture extending themselves by means of a bony substance, furnished by the periosteum, the dura mater, and cranium itself. (*Tenon Mém. de l'Acad. des Sciences,* 1758, *p.* 412, 413, 415, 416, 418.) But, still the reproduction is imperfect, as a space unfilled up is always left, even when the bone has lost only a small piece, like what is taken out by the trephine; and when the destruction of the cranium is very extensive, no reproduction at all happens. This fact is proved by examples mentioned by Saviard, Pott, Sabatier, &c.

When, in a case of necrosis, says Weidmann, a scale, or table of either a long, or flat bone, is separated, no regeneration follows, because the granulations, which rise up under the sequestrum, then serve as a periosteum, and as soon as the dead bone is removed, they become united to the adjacent parts.

It is likewise ascertained, that the power of reproduction in the bones is particularly active in the early periods of life, and in healthy subjects; and that it is languid and even annihilated in old persons, pregnant women, (*Bonns Thesaur. p.* 174.) and in venereal, cancerous, and ricketty patients. (*Callisen, Syst. Chir. Hodiernæ, Pars* 1, *page* 636.)

In order that a new bone may form, the periosteum and other membranes, concerned in the nutrition of the original bone, must have been spared from destruction. In fact, continues Weidmann, we observe, that, in cases where the tube of a long bone has suffered necrosis, the bone is never reproduced, when the periosteum has been destroyed by inflammation, or other causes. Surgeons ought also to understand, that it is not always a reproduction which has happened, when a part of a bone perishes; not even when a tubular portion of a long bone dies, and is contained in the medullary canal. For, says Weidmann, if the innermost layers of a long bone perish, while those which compose, as it were, the bark, are preserved, the latter swell and soften, as if they were actually a new bone. Several round apertures are observable upon their surface, which serve for the transmission of vessels, and are larger than those, which perform this office in the natural state. There are likewise formed large openings, or fistulæ, which, as in a new bone, lead to the medullary canal. Here it would be erroneous to conclude, that a new bone has been produced, and a very little attention will discover, that all is limited to some changes in the external part of the bone, which the necrosis has not affected.

When, therefore, the interior of the canal of a long bone is destroyed by a necrosis, which does not extend to the external layers, the case is not a reproduction of the bone.

When, however, we find the tube of any long bone included in a sort of osseous shell, and the surface of this tube smooth, like that of a bone in the natural state, we may be certain, that it has been detached directly from the periosteum, and that the bony shell, which contains it, is a new production. On the contrary, if the surface of the dead tube is rough, we may infer, that the separation has taken place between the innermost layers of the bone, and those which are superficial, the latter composing now the osseous shell, in which the sequestrum is included. (*Weidmann De Necrosi Ossium, p.* 31.)

This last theory, concerning the production of the osseous shell in necroses of the long cylindrical bones, is adopted by Richerand as the true one, not only in the instances specified by Weidmann, but in every other example, where the old bone seems to be included in another which has the appearance of being a new production, and which was supposed by Troja, David, &c. to be formed by the vessels of the periosteum. (See *Nosographie Chir. T.* 3, *p.* 158, 161, *Edit.* 4.) Boyer does not espouse this theory exclusively; but represents the thing as sometimes happening. (See *Traité des Mal. Chir. T.* 3, *p.* 426.)

As far as the observations of Weidmann informed him, the short or cuboid bones de not appear to be capable of reproduction. (*P.* 31.) Duverney mentions an astragalus, which was destroyed by necrosis; but, does not state, that any substitute for it was afterwards formed. (*Traité des Maladies des Os, p.* 458.)

Weidmann also never witnessed a reproduction of the spongy substance, such as it was before its destruction, round the medulla. He always found the substituted matter dense and compact, at least, for some time after its formation.

It is now admitted, however, that, in process of time, the inner surface of the new bone becomes cellular, and is lined with a membrane containing medulla. The regeneration of the medulla was first observed by Koehler, and afterwards in an extensive series of experiments, which Professor Thomson made with Dr. Alexander M'Donald, and which were published in the latter gentleman's inaugural dissertation in 1799. (See *Thomson's Lectures on Inflammation, p.* 393.) Mr. Russell does not appear to adopt this opinion, concerning the regeneration of the medulla; for, he states, that, after the absorption, or removal of the sequestrum, the cavity of the new bone becomes filled up with granulations, which are at length converted into bony matter. Thus, he says, the new bone differs from the original one, in being solid, instead of hollow. Authorities, however, are decidedly against Mr. Russell on this point: in the 5th vol. of the *Mem. de l'Acad. de Chirug.* is the history of a man, the whole of whose clavicle came away, without his being deprived of any of the motions of the arm. The death of this patient, which happened shortly afterwards, afforded an opportunity of examining how nature had repaired the loss. Another clavicle was found regenerated, which neither differed from the original one in length, or solidity; but, only in shape, being flatter, and not so round. It was connected with the acromion and sternum, just like the primitive bone.

The power, which thus reproduces bones, is only a modification of that, which unites fractures. Indeed, what consolidates broken bones, and is known by the name of *callus*, presents all the characters of new bone, begins and grows in the same way, and may be impeded and retarded in its formation by the same causes. (See *Callus* and *Fractures, p.* 405—408.) It is further highly probable, as Weidmann remarks, that the power, which effects the reproduction of bones, is the same as that, which, in the sound state, nourishes and supports these parts. But to what organ appertains the function of reproducing bones?

Many able men have ascribed the whole work to the periosteum. (*C. Havers; Duhamel, Mém. de l'Acad. de Sciences*, 1739, 1741, 1742, 1747. *Fougeroux, Mém. sur les Os; Paris*, 1760. *Swencke, Harlemer Abhandlungen* 1. *th. p.* 39. *Bertin, Ostéologie. Marigues, Abhandlung von der Natur und Erzeugung des Callus, p.* 199.)

Haller, (*Elem. Physiol. T.* 8, *p.* 352.) Callisen, (*Collect. Hafn. T.* 2, *p.* 187.) Tenon, (*Mém. de l'Acad. des Sciences*, 1758, *p.* 415.) Bordenave, (*Mém. sur les Os, p.* 227.) and many others, have seen a part of the new production spring up from the substance of the old bone; a thing, says Weidmann, which one is also led to believe by the fact, that, when the whole tube of a long bone is affected with necrosis, the epiphyses, which remain sound and untouched, unite and grow to the new tube, though no periosteum exists in the situation of the union.

Nor does Weidmann think, that the specimen of a fractured thigh, of which Blumenbach has published an engraving, proves the contrary. (*Geschiete und Berschreibung der Knocher; Göttingen*, 1786, *tab.* 1, *fig.* 1.) This preparation exhibits an union, which had taken place by means of a very broad osseous ring, encompassing the ends of the fracture, which lie far asunder. The event appears to Weidmann to have been the result of rachitis, or lues venerea, with which the young patient, according to Blumanbach himself, had been affected, and by which the nutrition of this bone had been disordered. For, says Weidmann, in other examples of united fractures, the ends of the bone are so connected together by the callus, that there does not exist a single point between them, where this substance is not effused, and the medullary canal itself is obstructed and filled with it.

That, however, the periosteum is frequently the organ of the reproduction of bones, is proved by the experiments of Troja, Blumenbach, Desault, and Koehler, since in these the bones were invariably regenerated, though there was nothing left of the old bone, that could furnish the new reproduction, except the periosteum.

If we examine the new bone, at the different periods of its developement, it appears in the earliest state in the form of a reddish fluid, as has been observed by Duhamel, Fougeroux, Bordenave, Haller, Callisen, and others. If we also attend to the progressive changes, which this fluid undergoes, we cannot but believe, that, as in the embryo, an organic and fixed arrangement of parts takes place. Indeed, it would be erroneous to consider such fluid as destitute of organization and extravasated at random. Thin and little in quantity on its first appearance, its consistence and quantity afterwards gradually increase (*Troja, p.* 42—44,) so that what at first appeared like a liquid, soon becomes a gelatinous substance, in which are developed, especially at its inner surface and towards its lower part, bony fibres, which incessantly become more and more numerous. These fibres in a short time form little layers and cells, and extend themselves every where, so that at length all which was fluid disappears, and the new bone is produced. While young, however, it is still spongy and reddish, (*Troja, p.* 44); but soon becomes denser, harder, and more solid, than that was for which it is a substitute, and it acquires the ordinary colour of the rest of the bones.

The external surface of the new bone, which, during the period of its formation, was irregular, and studded with several excrescences of various sizes, and pierced with apertures of different dimensions, becomes in the course of time smooth and regular, especially after the expulsion of the sequestrum.

The sides, or walls of the new bone, which at first were of considerable thickness, in time also grow thinner. (*Troja, p.* 21.) When the entire dead bony cylinder continues in its cavity, the new bone is neither shorter, nor longer, than the original. But, should one of the ends of the dead tube protrude from the cavity, while by the side of the affected bone, there is not another one capable of resisting the action of the muscles, the new bone will be shortened, and undergo some change in its shape and direction. Indeed, says Weidmann, the new bone, in its early state, from want of consistence, must yield to the efforts of the muscles.

Its shape is not exactly like that of the original bone: the sides are flatter; the usual angles, depressions, and eminences are not observable, and sometimes others are formed.

How admirable is the process, by which the muscles, detached from a bone affected with necrosis, have other insertions given to them, and are thus rendered capable of performing their functions! (*Troja, p.* 27.)

The periosteum, which swells as soon as the exfoliation of the old bone commences, shrinks, and is not at all thickened, when the exfoliation is finished. Troja, having destroyed the medullary structure of a long bone, found the periosteum swelled at the end of 36 hours; but he observed, that the whole of such swelling disappeared before the 25th day. (*P.* 43 and 67.)

The periosteum, which thus survives, adheres to the new bone, as it did to the old one: its vessels, which are now increased in diameter, and convey a larger quantity of blood, dive into large apertures in the regenerated bone, ramify every where in its substance, and nourish it.

Dr. Macartney's observations nearly agree with those of Troja and Weidmann, respecting the formation of the new bone by the periosteum, with this difference, however, that he does not describe the original periosteum as becoming afterwards attached to the new bone, but as disappearing. Dr. Macartney remarks, "that the first and most important circumstance is the change, which takes place in the organization of the periosteum; this membrane acquires the highest degree of vascularity, becomes considerably thickened, soft, spongy, and loosely adherent to the bone. The cellular substance, also, which is immediately connected with the periosteum, suffers a similar alteration: it puts on the appearance of being inflamed, its vessels enlarge, lymph is shed into its interstices, and it becomes consolidated with the periosteum. These changes are preparatory to the absorption of the old bone, and the secretion of the new osseous matter, and even previous to the death of the bone, which is to be removed. In one instance, I found the periosteum vascular and pulpy, when the only affection was a small abscess of the medulla, the bone still retaining its connexion with the neighbouring parts, as it readily received injection. The newly organized periosteum, &c. separates entirely from the bone, after which it begins to remove the latter by absorption;" and, while this is going on, its inner surface becomes covered with little eminences, resembling granulations. "In proportion as the old bone is removed, new osseous matter is dispersed in the substance of the granulations, whilst they continue to grow upon the old bone, until the whole, or a part of it, is completely absorbed, according to the circumstances of the case. What remains of the investment, after the absorption of the old bone, and the formation of the osseous tube, which is to replace it, degenerates, loses its vascularity, and appears like a lacerated membrane. I have never had an opportunity of examining a limb, a sufficient time after the termination of the disease, to ascertain, whether the investment be at last totally absorbed, but, in some instances, I have seen very little remaining. During the progress of the disease, the thickened cellular substance, which surrounded the original periosteum, becomes gradually thinner; its vessels diminish, and it adheres strictly to the new-formed bone, to which it ultimately serves as a periosteum." Dr. Macartney states, that the anatomical preparations, which authenticate the above observations, are preserved at St. Bartholomew's Hospital. (See *Crowther on White Swelling*, p. 183, *Edit.* 2.)

Mr. Stanley, however, lately shewed in the same museum, a preparation, which tends to confirm the accuracy of Troja's account of the old periosteum becoming adherent to the new bone. In this example, the periosteum is perfectly continuous with that covering the epiphyses.

If this were not the fact, we should have to explain in what way the periosteum of the new bone is formed. We know that the vessels of the original periosteum enter the new bone, in order to complete its formation, and it seems more consonant with the uniform simplicity of nature's operations, to suppose that this connexion is kept up, than that the old periosteum should be totally removed, after the production of the new bone, and another membrane of the same kind be then generated.

An interesting example of necrosis of the thigh-bone, very lately published by Dr. Hutchison, tends also to prove, that the new osseous shell is commonly formed by the periosteum, as, in this case, the medullary bags, or cells, were found completely ossified, (*Practical Obs. in Surgery, p.* 135.) and could not therefore be supposed to be capable of the work. Amongst the moderns, also, Dr. M'Donald deserves to be mentioned as one of the most distinguished advocates for the truth of Troja's explanation of this subject. (See *M'Donald's Thesis de Necrosi ac Callo; Edinburgh*, 1799.) Another late writer has adduced many arguments to prove, that the pulpy mass, which extends from one epiphysis to the other, and is itself at last converted into bone, is formed quite independently of the original bone, or the periosteum. (See *Russell's Practical Essay on Necrosis, p.* 27, *Edinb.* 1795.) This account, however, is contrary to the observations of Troja, David, Weidmann, M'Donald, Macartney, and numerous accurate observers. Indeed, a modern author seems to think the periosteum so essential to ossification, or the production of a new bone, that he attempts to explain the cause of fractures of the patella not becoming united by a bony substance, by adverting to the deficiency of periosteum upon it; a circumstance, which he deems also a strong argument against Mr. Russell's doctrine. (See *Hutchison's Practical Observ. in Surgery, p.* 141—142.)

Professor Boyer does not refer all the work of reproducing bones exclusively to the periosteum in every instance. We have already noticed, that he joins Weidmann in believing, that what seems a new bone is sometimes only a separation and thickening of the external layers of the original bone, which have escaped destruction. He notices the modifications, to which the phenomena of necrosis are subject when the disorder affects the whole thickness, and the whole, or the greater part of the circumference of a long cylindrical bone. "When the periosteum is destroyed together with the bone, and the medullary membrane, which does the office of an internal periosteum, is preserved, Boyer represents the latter membrane as undergoing similar changes to those which we have mentioned as taking place, under other circumstances, in the external periosteum, and he describes it as becoming the organ, by which the new bone is formed. (See *Traité des Maladies Chir. T.* 3, *p.* 432.) But, when the whole thickness and circumference of a long bone are destroyed, together with the medullary membrane, while the periosteum survives, Boyer agrees with Troja, &c. in believing the latter membrane to be the means by which the new bone is generated.

The internal surface of the new bone is lined by a new membrane, which serves as a periosteum, and is at first hardly distinguishable. (*Troja, p.* 56.) In the early state, it is soft and pulpy; (*ibid. p.* 22.) but, by degrees, it grows thicker and firmer, and is at length converted into a true membrane, which sends a great number of vessels into the substance of the bone. When this membrane is torn off, the surface, which it covered, is found somewhat smooth, the edges of the bony layers, and projections of the fibres being blunt and rounded.

The cavity of the new bone includes, and almost entirely conceals the dead fragments. Sometimes, however, the new bone forms a sort of bridge over the sequestrum, in such a manner, that the cavity is open above and below, in both which situations the sequestrum can be felt. (*Hunter, in Med. Obs. and Inquiries, Vol.* 2, *p.* 418.)

Sometimes, it is only a narrow cross piece, which forms the bridge retaining the sequestrum. (*Weidmann, vid. Tab.* 5, *Fig.* 1, *a.*)

The new bone may also have an opening in it, out of which the dead portion protrudes. (*Ibid. p.* 35.)

Sometimes the cavity of the new bone is single; while, in other instances, there are several successive cavities in the direction of the length of the bone, with transverse interspaces between them; or else the cavities are situated laterally with respect to each other, and divided by partitions. (*Weidmann, Tab.* 7, *Fig.* 2.)

These cavities are proportioned in size and shape to the fragments of dead bone, which lodge in them. It occasionally happens, that they open into some neighbouring joint, and bring on suppuration there: a very unfavourable complication. (*Ibid. p.* 34 *and Tab.* 6, *Fig.* 3; *also, Boyer Traité des Mal. Chir. Tom.* 3, *p.* 435.)

Let us next follow Weidmann, and take notice of the holes, by which the cavities, including the dead pieces of bone, open externally, which Troja denominated the large foramina, and which the preceding excellent writer preferred calling the *cloacæ*, because they serve to convey outward the matter and any separated pieces of bone. In the beginning of the disorder, they are not observable, a certain space of time appearing to be requisite for their formation.

They are noticed in long cylindrical bones, whether original, or of new production, whose cavities contain dead fragments.

These openings vary in number: when the sequestrum is small, only one is found; but, when the piece of dead bone is extensive, there may two, three, or four. Weidmann never saw more than five. But, Troja met with eight. (*P.* 58.) Weidmann possessed a small portion of the diploe of the os innominatum, which was affected with necrosis, and contained in a bony cavity, that had no external opening whatever.

When there are several distinct cavities in the same bone, containing dead fragments, each cavity has at least one external opening.

These *cloacæ*, or apertures, are commonly situated at the lower and lateral parts of the cavities; pass obliquely outwards; and communicate with fistulous ulcers, which open on the surface of the skin. (*David, p.* 186.) Some of the cloacæ, however, form at the middle, or, (what is exceedingly rare) at the upper part of the cavities, and proceeding outward, without any oblique track, go to the front, back, or lateral parts of the limb.

They are of a round, or oval shape, or nearly so. Their usual size is such, that it will just admit a quill, and they vary very little from this dimension.

They terminate internally by converging approaching edges, in the manner of a funnel; while, on the contrary, the margins of their outer extremity expand. The canal, between these two orifices, is sometimes long, sometimes short, and in certain cases of no extent at all.

Different opinions have been broached, respecting the causes, which produce the apertures in the new bone, termed by Weidmann the *cloacæ*.

M. David says, that the pus, collecting in an early stage of the disease between the bone and periosteum, distends and corrodes this membrane, and that the openings, which form in it, become afterwards a cause of fistulæ in the new bone. (*P.* 186.) But, it is observed by Weidmann, that this explanation is inadmissible, since the existence of the collection of pus, mentioned by M. David, is not proved by observation: in fact, it was never met with by Troja, Blumenbach, Desault, Koehler, and many others, in repeated experiments made on the subject. (*Troja, p.* 56 *and* 66; *Weidmann, p.* 36.)

Koehler thought he had seen the new bone itself destroyed by the pus, and *cloacæ* thus produced. (*P.* 68—72.)

Weidmann, however, deems this opinion quite as improbable as the preceding, for the fact of the surface of these bony apertures being always smooth, always formed in one manner, and constantly lined by the periosteum, decidedly proves, that they cannot arise from erosion.

Troja, in his third experiment upon the regeneration of bones, remarked, that 42 hours after the destruction of the medulla, there took place, between the bone and the periosteum, an effusion of lymph, which was at first thin and little in quantity, but afterwards became thicker. He noticed, in the midst of this gelatinous substance, *some small spaces, where it was deficient, and which had, instead of it, a subtile, whitish, dry incrustation, which though tolerably adherent, could be rubbed off. These small spaces, according to Troja, produce the apertures, called the cloacæ.* (*Troja, p.* 45.)

In another experiment, he had an opportunity of examining the above little spaces at the end of 48 hours; he affirms, that they were replaced by the large apertures, or cloacæ, of the new bone; (*P.* 47.) and that such openings were invariably formed in the place of the small incrusted spaces already described. (*P.* 58.) As Troja took notice, that no lymph was effused at these particular points, he was inclined to impute the circumstance to a defect in the ossification, and, *perhaps, to the death of some parts of the periosteum.* Weidmann acknowledges, that the mode, in which the formation of the cloacæ happens, is exceedingly obscure; and expresses his belief, that Troja's account of it approaches the nearest to the truth. But, says he, one thing is certain, namely, that these openings have no other use, but that of conveying outward the pus, which collects in the cavity, and the small bony fragments, since, as soon as every atom of dead bone has passed out, they diminish, and, at length, are totally obliterated. (*Weidmann De Necrosi Ossium, p.* 36.)

It is a remarkable circumstance, in the history of necrosis, that, in favourable instances of the disease, the inflexibility and firmness of the limb are preserved, during the whole of the process, by which the new bone is formed. Consequently, the new bone must have begun to grow, and have acquired firmness before the old bone separates, or is absorbed. Were this not the case, the limb must become flexible and useless, the moment the dead bone is removed. Another consequence of the new bone being formed, before the removal of the old one, is that the former must surround and include the latter. For, since the lifeless portion of bone completely occupies the space between the two living ends, these cannot be immediately connected by the new bony matter. The connexion can alone be completed by the new bone being deposited on the outside of the old one, from one end to the other, and attaching itself to the portions which still remain alive. The new bone must also be necessarily larger, than the old one, because externally situated, and hence the affected limb, after the cure is complete, will always continue larger, clumsier, and less shapely than the other. The length of it, however, remains unaltered, because the old bone retains its attachment, while the rudiments of the new bone are lying on its outside, and connect the living ends of the old one, by an inflexible mass, equal in length to the portion, which is destroyed.

Thus we see, that, in the process, which nature follows in the formation of the new osseous shell, the old bone serves as a mould for the new one, and the first step of the process is to surround the old bone with an effusion of coagulating lymph. (See *Russell on Necrosis, p.* 2—7.)

When the sequestrum is thrown off slowly, the inflammation is moderate; but, when it separates quickly, while the new bone is in a soft state, the detachment is always preceded by severe inflammatory symptoms, and followed by a temporary loss of the natural firmness of the limb. This premature separation of the sequestrum often occurs in necrosis of the lower jaw, and the chin consequently falls down on the neck. In certain cases, the sequestrum separates at each end from the living portions of the old bone, before the new osseous shell has acquired firmness, so that the limb feels as if it were broken in two places. (*Russell.*)

Let us next consider the states and circumstances of necrosis, in which the art of surgery may be advantageously exerted in the assistance of nature, and the means which may be employed for this purpose.

A common error of medical and surgical practitioners is always to impute the cure of every disease to whatever remedies happen to be employed, and successes are too often boasted of, the merit of which belongs entirely to nature. It is, indeed, not very unfrequent to hear remedies panegyrically spoken of, which counteract the salutary efforts of nature, who, in this case, is obliged to overcome both the disease, and the irrational treatment, which is applied to it. As Weidmann observes, this erroneous mode of considering things has happened particularly often amongst surgeons who have had cases of necrosis under their care, all of whom boast of the cures, which they have accomplished, although some employed absorbent earths, others, aromatics; some, spirituous applications; others, balmy remedies; some, acids; others, caustics; and, some, armed with a wimble, made numerous perforations in the dead bone; while many others rasped the part, or attacked it with the trepan, cutting forceps, the gouge and mallet, or even the actual cautery; and a certain number did nothing more, than apply dry lint. Nature, who was favourable to all, did her own work in silence, whatever were the remedies employed for her assistance, whether mild and inert; acrid and corrosive; or hurtful and improper.

We have already noticed, that a dead portion of bone separates from the living exactly in the same way, as gangrenous soft parts spontaneously drop off, without the interference of art. The separation happens precisely at the points, to which death has extended; limits, which are well understood only by nature, and of course can be measured only by her. Art would incur great risk of either going beyond them, or else of not reaching them at all. Perhaps, it may be deemed unsafe to confide the process of separation, or exfoliation, to nature. But, in what other manner could it be more safely accomplished, without hemorrhage, or pain to the patient—without any risk of a recurrence of inflammation, or of a fresh necrosis?

Is there reason to fear, that, when every thing is left to nature, the separation cannot be finished till after a very long period of time? It is true, says Weidmann, that the process frequently requires a considerable time; but, as the vitality of the bones is not possessed of much energy, and their component parts strongly cohere, slowness is inevitable in an operation, which depends entirely upon the vital power. What is it then which surgery can do to accelerate the process?

Will any of the above-mentioned topical applications have this effect? They are put upon the inert surface of a dead piece of bone, in which no vital power, or action, can be again excited. When acrid, they prove irritating, inflaming, and destructive of the neighbouring flesh, without any utility—and cause pain to the patient, which is compensated by no good. Would the perforations, recommended by Celsus, Belloste, and many others, have the desired effect? If, says Weidmann, they are confined to the dead bone, they cannot have more effect, than the scarifications, which were formerly practised by ignorant surgeons in cases of gangrene; and, if they extend to the living bone, this will be injured, or at least run the risk of being so. Lastly; Weidmann demands, if the separation can be accelerated by the actual cautery, which cannot act upon every point of the necrosis, and which, unless applied with the greatest precautions, will burn the subjacent parts, and bring on a new attack of inflammation, without forwarding the exfoliation in the smallest degree?

Of what use can rasping and scraping instruments be, which act merely upon the dead part? Or will the gouge, and other cutting instruments do more good? They cannot take away the whole of the dead portion, without injuring the adjacent living bone, and causing a risk of another necrosis. And, if they leave any pieces of the old dead bone behind, nature will be as long in effecting the separation of these, as she would have been in detaching the entire necrosis.

Weidmann mentions a case, which occurred in the hospital St. Roch at Mentz. A man's legs were seized with mortification, in consequence of exposure to cold; the whole of the dead parts separated; and the bones were sawn through on a level with the living flesh. A portion of the end of each bone, however, was afterwards thrown off altogether by nature, and Weidmann thence concludes, that the previous use of the saw had been fruitless. Weidmann then cites another case of mortification of the leg and half of the thigh, which was the consequence of a putrid fever. The leg sloughed away, leaving the lower portion of the thigh-bone uncovered and projecting. Under a tonic plan of treatment, this part of the bone spontaneously separated. As, however, a considerable quantity of integuments had been destroyed, the ulcer was slow in healing; but, it cicatrized at last, and the young woman continued well long afterwards.

Weidmann has quoted the memorable case, in which Mr. Charles White first sawed off the upper part of a diseased humerus. (See *p.* 49 *of this Dictionary.*) As, in this instance, nature accomplished of herself the separation of another dead portion of the same bone, two months after the operation, Weidmann seems disposed to think the cure would have happened equally well without it.

In cases of slight superficial necrosis, surgeons have frequent opportunities of trying every kind of topical application; and when the cure takes place, during the use of any of them, the benefit is ascribed to whatever happens to be in use. But, says Weidmann, in numerous more serious examples of necrosis, it is impossible to make these applications reach the whole surface of the dead bone; but, notwithstanding this circumstance, the separation is not impeded. Some exfoliations happen, without our knowing of their occurrence, and without a thought having been entertained of promoting them by any vaunted applications. We even see necroses separate, whose situation rendered them inaccessible to our remedies; such are the necroses, which occur within the long bones, and comprehend the whole of their cylindrical shaft or body. What surgeon shall presume to boast of his having effected by topical applications, the separation of the whole lower jaw-bone; a thing, which nature has very frequently accomplished? And, when, as often happens, the entire diaphysis of the thigh-bone, tibia, or other long bone, comes away; or, split longitudinally, such bone loses a half of its cylinder; how is it possible for any topical applications to reach every point, at which the separation occurs?

The internal remedies, such as assafœtida, madder, sarsaparilla, hemlock, belladonna, onopordum, lime-water, &c. recommended by numerous practitioners, have in reality no direct efficacy in promoting the separation of necroses: if, says Weidmann, they do any good, it can only be by their tonic and alterative qualities, or rather by keeping the patient amused, so as to gain the requisite time for the completion of the process of exfoliation. The employment of all these ineffectual means, Weidmann conceives, must have originated from ignorance of the process, followed by nature in separating dead portions of bone, and from ascribing to the arterial pulsations, or the power of the granulations, what certainly depends upon the action of the absorbent vessels.

A question here naturally presents itself—Would there be any utility in exciting by stimulants the action of the lymphatic vessels, in order to accelerate the separation, of which it is the efficient cause?

Weidmann thinks, that very beneficial effects might result from the plan. But, he asks, what means should be used for this object? Cold? Purgative medicines? Repeated vomits? Squills? Camphor? Neutral Salts? Issues? (*Vid. Wrisberg, Comment. Soc. Reg. Gött. Vol.* 9, *p.* 136, 1789.) He adds, that, perhaps, many valuable discoveries will hereafter be made on this subject.

The reasons already detailed, and a variety of experiments successfully made by Weidmann, lead him to set it down as an established principle, that the separation of a necrosis is almost entirely the work of nature, and that surgery can do very little in the business.

Ignorance of this important fact paved the way to the wrong practice of making incisions, for the purpose of exposing the whole surface of a necrosis, immediately the existence of the disorder was known. As such incisions very soon closed up again, so as to leave only a small outlet for the matter, they were in many cases repeatedly practised before the dead bone became loose.

The avowed design of the incisions was to make room for the topical remedies, which were to render the exfoliation quicker; but, as these remedies possess no real efficacy, it follows, that making incisions, before the dead bone is loose, only torments the patient, without producing the least benefit.

The orifices of the ulcers, then, which allow the discharge to escape freely, are, says Weidmann, sufficient as long as the fragments of bone are not entirely detached, and the surgeon should all this period abstain from the use of the knife.

Although Weidmann condemns every mode of treatment, which is inefficacious, painful, and sometimes even hurtful, he would not have it supposed, that he altogether rejects all assistance from medicine. On the contrary, he approves of all those means, which are consistent with the views of nature, which really assist her, and do not teaze the patient to no purpose. In short, says he, *the indications are limited to removing the original cause of the disease; to alleviating the symptoms; to supporting the patient's strength, and improving the state of the constitution, in whatever respect it may be bad; and, lastly, removing the dead portions of bone, when they become loose.*

Above all things (continues this sensible practitioner) the surgeon must not regard every piece of exposed bone, as necessarily affected with necrosis, and, in consequence of such idea, have recourse to acrid, drying, caustic applications. Such means are not only useless, but absolutely pernicious; because they may actually cause a necrosis, which did not exist, before they were used, and which would not have taken place at all, if only mild simple dressings had been employed.

When the disease presents itself with violent symptoms, the inflammation and fever being intense, the severity of the case is to be assuaged by low diet, antiphlogistic remedies, emollient applications, and venesection in moderation, the disease being one which is of long duration, and apt to wear out the patient's strength. Here, perhaps, topical bleeding ought always to be preferred to venesection. When the necrosis has arisen from syphilis, scrophula, or scurvy, &c. the medicines, calculated for the cure of these affections, must be exhibited, ere any favourable changes can be expected in the state of the diseased bone.

Lastly, it is the duty of the practitioner to extract the fragments of dead bone, in order that the deficiencies produced by them may be filled up, and the ulcers of the soft parts heal.

Nature, who succeeds by herself in detaching the dead pieces of bone, can do very little in promoting their passage outward. Frequently, indeed, she has no power at all in this process, and it is only from surgery that assistance can be derived. When a dead piece of bone is still adherent at some points, its extraction should be postponed, until it has become completely loose. If it were forcibly pulled away, there would be danger of leaving a part of it behind, which must have time to separate, ere the cure can be accomplished.

But, when a fragment is entirely detached, and the orifices of the sores are sufficiently large, it is to be taken hold of with a pair of forceps, and extracted.

When the ulcer has only a very narrow opening, suitable incisions must be practised, in order to facilitate the removal of the loose dead bone.

Sometimes, the dead fragment protrudes from the ulcer, and projects externally, so that, if loose, it admits of being taken hold of with the fingers and removed. In this way, Weidmann took away a large dead piece of the humerus, which protruded nearly two inches out of an ulcer in the middle of the arm. The patient was a young lad, 14 years of age; and the limb concave within, convex externally, thicker, and one inch shorter than its fellow. He got quite well three weeks after the removal of the dead bone.

We have already adverted to the example, recorded by Weidmann, in which a shoemaker removed by himself nearly the whole body of the tibia. Doubtless, the projection of the bone, and its looseness, enabled the man to do this easily with his fingers. But, there are cases, which present more difficulty: such are those, in which the sequestrum is included in a cavity, either of the original, or new bone.

The old surgeons were in the habit of amputating limbs, which were in this state; although instances were not wanting in their days to prove the possibility of relieving the disease, without amputation. This blameable custom of removing every limb, thus affected, is justly exploded from modern surgery. Albucasis was the first, who attempted to cure such a case of necrosis, by the judicious employment of the knife and saw. (*Lib.* 2, *cap.* 88.) The same kind of practice was successfully adopted in two instances by the celebrated Scultetus. (See *Armament. Chirurg. Tab.* 46, *and Obs.* 81.) This commendable method, however, afterwards fell into disuse, until M. David, by twenty examples of success, refuted all the objections which had been urged against it. (*P.* 197.) Since the period of this distinguished author, the practice has been imitated by all enlightened surgeons, so that the case is no longer regarded, as a disease necessarily requiring amputation. M. Bousselin has cut out the sequestrum eight times from the tibia, and four times from the thigh-bone, with perfect success. (*Vid. Mém. de la Societé Royale de Médecine, Tom.* 4.)

The method consists in exposing the bone, and making in it an opening of sufficient size for the removal of the loose dead fragments.

Experience has proved, not only that patients, affected with necroses, easily bear this operation, but, also, that, after its performance, the ulcers commonly heal very favourably, the health becomes re-established, and the functions of the part affected are hardly at all impaired.

Surgeons, however, are not indiscriminately to choose any period for doing the operation. If they are too hasty, they will run a risk of finding the dead portion of bone still adherent to the adjacent parts; and, if they delay too long, the patient may be irrecoverably reduced, while the new bone, on account of the hardness which it has now acquired, cannot be so easily perforated.

Patients are met with, who have been afflicted with necrosis several years. In such cases, great circumspection is necessary, and the practitioner should carefully endeavour to ascertain, that the dead pieces of bone have not been absorbed, or come away piecemeal in the discharge, lest an useless operation should be done, as once happened in the practice of M. Bousselin. (*Mém. de la Societé Royale de Médecine*, *T.* 4, p. 304.) Therefore, when the disease is of long continuance; when the discharge is much less than it was at the commencement; when small pieces of bone have at times been voided; and the sequestrum cannot be felt with a probe; it is doubtless, says Weidmann, most prudent to abandon all idea of operating, and allow nature to finish what she has so well begun. In short, when the sequestra are undergoing a gradual absorption, without ever making their appearance externally, or giving any considerable disturbance to the constitution; or, when the dead bone is making its way outward without occasioning urgent inconveniences; the surgeon should interfere very little with the natural progress of the case. When the dead bone does not tend to make its way through the skin, but lies quietly concealed in the new osseous shell, the occurrence of extensive suppurations may be prevented, by occasionally applying leeches, and keeping open a blister with the savine cerate, as recommended by Mr. Abernethy in his lectures, and Mr. Crowther, in his work on the White Swelling. The blister will, at the same time, have great effect in promoting the absorption of the sequestrum, and, of course, in accelerating the process of cure.

If the surgeon operate as soon as the sequestrum becomes loose, he will find the new bone so soft, that it can be divided with a knife; a circumstance, which materially facilitates and shortens the operation.

Keeping in mind the foregoing precepts, the surgeon is to begin with exposing the bone, in which the sequestrum is contained. When the bone lies immediately under the skin, Weidmann recommends making such incisions as will lay bare the whole of its surface, and when its situation is deeper beneath the muscles, he even sanctions cutting away as much of the flesh, as may be necessary to allow the instruments to be freely worked upon the bone. I cannot, however, see the propriety of this advice: exposing the whole surface of the bone in the first instance, before it is known, whether the saw need be so extensively used as to require such a denudation, certainly appears irrational. And, as for cutting away any portions of muscle, this can be no more necessary here, than it is in the operation of trephining. But, it is unquestionably proper to make with the bistoury sufficient space for the use of whatever instrument is employed for the division of the bone. Yet, it is only necessary to make this exposure in the first instance in one place. The surgeon can afterwards enlarge the incision, or practise others, as circumstances may indicate. The surface of the bone being brought into view, if the cavities, in which the dead fragments lodge, present apertures, which are too narrow, these apertures must be rendered larger by means of small trephines, or saws constructed on the principles of those described by Mr. Hey, of Leeds. With such instruments the pieces of bone, extending across the above openings, and impeding the extraction, may also be removed.

But, when the preceding cavities are closed on every side, and it is impossible to reach into them in any other way, than through the cloacæ, a trephine is to be applied, which must comprise within its circle a half of the fistulous opening. The crown of the trephine, however, must not be broader than the cavity of the bone, nor yet narrower than the sequestrum.

If, after making a perforation in this manner, the sequestrum should be found too large to pass through the opening, a small saw must be employed for enlarging the aperture.

When the bone is so hard and thick, that it cannot be well cut with a saw, the surgeon has the sanction of authority, and experience, for using a gouge and mallet.

When the sequestrum is found to be very large, it will be necessary to expose more of the surface of the bone by incisions. In this sort of case, Weidmann recommends applying the trephine to the upper and lower parts of the cavity, and then cutting away the intervening portion of bone with the saw, or gouge. But, there can be no doubt, that a more prudent way would be to go on with the enlargement of the aperture in the bone, at the place where the first perforation took place, if the sequestrum presented itself equally well there, because, by proceeding in this manner, the surgeon might discover, that the dead fragment could be taken out, without so great a destruction of bone, as is caused in the other mode; and, if this were not to be the case, no harm is done, as the necessary removal of bone can be continued.

When the bone, which includes the sequestrum, is a new production, and the operation is not too long deferred, the soft state of the bone will enable the operator to perform the needful excisions with the bistoury alone.

When the sides of the cavity, in the original bone, are thin, fragile, and pierced with numerous holes, the surgeon can break away a sufficient portion with a pair of forceps.

When several sinuses exist in the bone, each may be dilated, in the manner which seems most advantageous.

Sufficient openings having been made into the cavities including the sequestra, the next object is to extract these dead portions of bone. In accomplishing this part of the operation, Weidmann particularly advises two things; first, that no piece of the sequestrum be left behind; secondly, that no injury be done to the membrane, which lines the cavity, in which the dead bone is lodged.

This author observes, that there are examples, in which the vicinity of certain parts impedes the surgeon from making an opening in the bone, large enough for the extraction of a voluminous sequestrum in an entire state. In this circumstance, he recommends the sequestrum to be broken into pieces by any convenient means, and the fragments to be separately removed.

Weidmann has recorded an extremely interesting case to prove how much may sometimes be effected by taking away the sequestrum. A man, 34 years of age, who had an internal necrosis of the tibia, with abscesses and œdema of the whole limb, and who was reduced to the lowest ebb of weakness, was put under this excellent surgeon's care. A perforation was made with a trephine in the upper head of the tibia; but, this opening not proving ample enough, it was enlarged with a small saw, and the gouge and mallet. The sequestrum was then extracted. The patient's state afterwards gradually improved, and in nine months he was completely well.

It is not to be dissembled, however, that cases do exist, in which amputation affords the only chance of saving the patient's life. In fact, it sometimes happens, that the cavities, in which the sequestra are contained, communicate with those of the neighbouring joints, which then become filled with matter, and caries attacks parts of the bones, to which the necrosis does not extend. On some occasions, the dead pieces of bone are very numerous, and each has a separate cavity; while, in other instances, the sequestra lie so deeply, that a passage for their extraction cannot be prudently attempted. Sometimes, also, a necrosis is complicated with another disease in its vicinity. Lastly, such may be the reduced state of the patient's health, and the particular condition of the necrosis itself, that the constitution cannot hold out during the whole time, which would be requisite for the detachment of the sequestrum. Under circumstances like these, amputation is necessary, and ought not to be delayed.

For the authorities of many of the observations and cases in the foregoing article, and for additional information on the subject, see *Albucasis, lib. 2, cap.* 88. *Scultetus, Armament. Chir. Tab.* 46, *and Obs.* 81. *Belloste, Le Chirurgien d'Hôpital, part* 1, *chap.* 12. *J. Louis Petit, Traité des Maladies des Os, Tom.* 2, *chap.* 16. *Monro's Works by his Son. Tenon in Mém. de l'Acad. des Sciences,* 1758. *Aitken, Systematic Elements of the Theory and Practice of Surgery, Edinb.* 1779, *p.* 288. *Callisen, Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 393, *Göttingen,* 1800. *Charles White, Cases in Surgery, London,* 1770, *p.* 57, *&c. Wrisberg, Comment. Soc. Reg. Gott. Vol.* 9, *p.* 136, *&c. Bousselin, in Mem. de la Societé Royale de Medecine, Tom.* 4. *Louis, in Mém. de l'Acad. de Chirurgie, Tom.* 5. *Chopart's Dissert. de Necrosi Ossium, Paris,* 1776. *David's Obs. sur une Maladie connue sous le nom de Nécrose, Paris,* 1782. *Pott's Chirurgical Works, Lond.* 1779, *Vol.* 1, *p.* 32. *Bromfield's Chir. Cases and Observations, Vol.* 2, *p.* 9. *C. G. Kortum, Comment. de Vitio Scrofuloso, Lemgoviæ,* 1789, *T.* 2, *part* 3, *cap.* 11. *Knolli, Dissert. de Carie Ossium Venerea; Lips.* 1763. *S. G. Ræderer, Progr. de Ossium Vitiis Observationes continens; Goettingæ,* 1760. *Lind's Treatise on the Scurvy. Fabre in Mém. de l'Acad. de Chir. T.* 4, *p.* 91. *Bonn's Thesaurus Ossium Morbos. Bonet, Med. Septentr. l.* 2, *Sect.* 4, *cap.* 25. *Ephemer. Acad. Nat. Cur. Ann.* 7 *et* 8, *obs.* 4. *Guernery, in Mém. de l'Acad. de Chir. Tom.* 5, *in* 4*to. p.* 355—368. *Belmain, ibid. p.* 363. *Acrel, Chirurgische Vorfälle, Uebers, Von Murray, Vol.* 1, *p.* 194. *Van Wy, Vermischte Chirurgische Schriften, Nuremberg,* 1786, *p.* 192. *Trioen, Observat. Med. Chir. Fascic. L. B.* 1743, *p.* 46. *Reiplein in Richter's Chirurgische Bibliothek, T.* 7, *p.* 569. *Henkel, ibid. T.* 2, *p.* 42. *Dussaussoir, ibid. T.* 8, *p.* 71. *Meckren, Obs. Med. Chir. cap.* 69. *Taconi De nonnullis Cranii Ossiumque Fracturis, &c. Bononiæ,* 1751, *p.* 17. *Blancard, Inst. Chir. p.* 549. *Duhamel, Mém. de l'Acad. des Sciences,* 1741. *Boehmer, Diss. de Ossium Callo. Lips.* 1748, *p.* 17 *and* 21. *Cheselden, Osteographia, or Anat. of the Human Bones, London,* 1733, *Tab.* 49, *Fig.* 4. *Morand, in Platner's Vermischte Chirurgische Schriften, p.* 447. *Ruysch, Thesaur.* 10, *No.* 176. *Duverney, Traité des Maladies des Os, p.* 457, *Paris,* 1751. *Phil. Trans. No.* 312. *Wedel, in Ephem. Natur. Cur. Dec.* 2, *Ann.* 2, *p.* 396. *C. Battus, in Chir. Tract.* 4, *Cap.* 8, *p.* 275. *Koschius, in Roonhuysen's*

*Historische Heilkuren, B.* 1, *p.* 217; *Nuremberg*, 1674. *Hofmann, in Eph. Nat. Cur. Dec.* 3, *Ann.* 9 *et* 10, *p.* 310. *Diemerbroeck, vid. Wolfii Obs. Chir. Med. lib.* 2, *obs.* 18, *p.* 212. *Wright, in Phil. Trans. abridged, Vol.* 9, *p.* 252. *Fabricius Hildanus, Obs. Chir. Cent.* 4, *Obs.* 91. *Raw, Supellex Anatom. Edit. a. B. S. Albino. Ludg. Batav* 1725, *p.* 13. *Dobyns in Cheselden's Osteographia, tab.* 49, *Fig.* 4. *Mackenzie, in Med. Obs. and Enquiries, Vol.* 2, *p.* 299. *Ludwig, Advers. Med. Pract. Vol.* 3, *p.* 60. *Bousselin, in Hist. de la Soc. Royale de Médecine*, 1780, 1781, *Paris, p.* 121—297—305. *Stalpart in Van der Wiel's Cent.* 1, *Obs.* 96. *Muralto, in Schriften von der Wundarzn. Bale* 1711, *Obs.* 202, *p.* 655. *De la Motte, Traité Complet de la Chirurgie, Tom.* 4, *p.* 284. *Ellinckhuys in Trioen's Obs. Med. Chir. fasc. Ludg.* 1743, *p.* 115. *Ruysch Opera Omnia Anat. Med. Chir. Amst.* 1721, *Tom.* 1, *p.* 94. *Laing, in Med. Essays and Obs. Edinb. Vol.* 1, *art.* 23. *Johnson, ibid. vol.* 5, *art.* 23. *Hunter, in Med. Obs. and Enquiries, Vol.* 2, *p.* 303. *Sigwart, Diss. de Carie consumptæ tibiæ notabili jactura, Tab.* 1756. *T. Bartholine, Act. Med. et Phil. Hafn. Vol.* 3, *Obs.* 114, *p.* 287. *Hofmann, Mantissa, Obs. Select. Obs.* 28. *Saviard, Nouveau Recueil d'Observ. Chirurgicales, Paris*, 1702, *Obs.* 126. *Le Dran, Obs. de Chirurgie, T.* 2. *Obs.* 104. *Michael, in Richter's Bibliothek. T.* 5. *Troja, de Novorum Ossium in integris aut maximis, ob morbos, deperditionibus, Regeneratione, Experimenta. Lutetiæ Parisiorum*, 1775. *Troja's Work, though drawn up in an incorrect style, as Weidmann remarks, contains many highly interesting Experiments. Blumenbach, in A. G. Richter's Bibliothek, T.* 4, *p.* 107. *Desault's Parisian Chirurg. Journal, Vol.* 1, *p.* 100, *and Vol.* 2, *p.* 199. *Koehler, Experimenta circa Regenerationem Ossium, Gotting.* 1786. *This is a valuable work, and contains the original discovery of the reproduction of medullary structure. I. P. Weidmann, De Necrosi Ossium, Fol. Francofurti ad Moenum*, 1793. *This publication is, perhaps, the best general account of the whole subject of necrosis. It is not only enriched with the observations of numerous other writers on the disease, but contains the most approved theories and opinions, respecting many other affections of the bones, Caries, Exfoliations, &c. It was a great assistance to me in the composition of the foregoing article. Consult also Richerand's Nosographie Chirurgicale, Tom.* 3, *p.* 153, *&c. Edit.* 4, *Paris*, 1815. *Dr. Alex. M'Donald's Thesis de Necrosi ac Callo, Edinb.* 1799. *Hutchinson's Pract. Obs. in Surgery, p.* 130, *&c. London*, 1816. *James Russell's Practical Essay on a certain Disease of the Bones, termed Necrosis*, 1794. *Whately's Pract. Obs. on Necrosis of the Tibia*, 1815. *Macartney in Crowther's Obs. on White-Swelling, &c. Edit.* 2. *Encyclopédie Méthodique, Partie Chir. art. Necrose. Levéillé's Nouvelle Doctrine Chirurgicale, T.* 4, *p.* 321, *&c. Paris*, 1812. *Larrey's Mém. de Chirurgie Militaire, T.* 3, *p.* 367, *&c. Thomson's Lectures on Inflammation, p.* 39, *&c. Edinb.* 1813. *Boyer's Traité des Maladies Chirurgicales, T* 3, *p.* 418, *&c. Paris*, 1814. *Delpech, Précis Elémentaire des Mal. Chir. T.* 1. *Chap.* 3. *Paris*, 1816. Some account of an operation in which M. Dupuytren, of Paris, removed the mental portion of the lower jaw, may be found in the *London Medical Repository, Vol.* 3, *p.* 432. The wound healed by the first intention, and the patient got quite well.

**NEPHROTOMY.** (from νεφϱος, a kidney; and τεμνω, to cut.) The operation of cutting a stone out of the kidney; a proceeding which, perhaps, has never been actually put into practice. In the *Abrégé Chronologique de l'Histoire de France, par Mézerai*, and in the Philosophical Transactions for 1696, two cases of what is called nephrotomy are mentioned; but several circumstances in the accounts led Haller and others to conclude, that the operation alluded to in the first work, was nothing more than the high operation for the stone. With respect to the example in the latter work, the particulars are not detailed enough to prove that an incision was really made into the kidney. There is no doubt that stones have often been extracted from abscesses about the region of the kidney, after being touched with a probe. But, with regard to cutting into the kidney, the deep situation of this viscus, and the want of symptoms, by which the lodgment of a stone in it can be certainly discovered, will always be strong objections to the practice. When a stone, from its size, cannot pass from the kidney, and excites inflammation and suppuration, no doubt, the surgeon may make an incision into the tumour, and extract the calculus. In this sense, nephrotomy is certainly a practicable operation. Warner contends, that it can only be practised in such circumstances, notwithstanding whatever may have been said by Marchetti, or others, upon the subject. In such a case, the operation would not be attended with any greater difficulty, than the opening an abscess in any other part of the body. (See *Warner's Cases in Surgery, p.* 241, *Edit.* 4.)

**NODE.** A swelling of a bone; a thickening of the periosteum, or a fascia; or a tumour on a tendon, from a venereal cause. See *Exostosis*, and *Venereal Disease*.

**NOLI ME TANGERE.** A species of *lupus*, under which term Dr. Willan intended to comprise, together with the *noli me tangere* affecting the nose and lips, other slow tubercular affections, especially about the face, commonly ending in ragged ulcerations of the cheeks, forehead, eyelids and lips, and sometimes occurring in other parts of the body, where they gradually destroy the skin and muscular parts to a considerable depth. (*Bateman's Synopsis of Cutaneous Diseases, p.* 296, *Edit.* 3.)

Sir E. Home says, that the ulcers, for which he has been led to employ arsenic, are named, from the virulence of their disposition, *noli me tangere*, and are very nearly allied to cancer; differing from it in not contaminating the neighbouring parts by absorption, but only spreading by immediate contact. Ulcers of this kind differ exceedingly from one another in their degree of virulence; but they are all so far of the same nature, that arsenic in general agrees with them, and puts a stop to their progress, while they are aggravated by milder dressings. (*Home on Ulcers, edit.* 2, *p.* 267.)

The disease generally commences with small tubercles, which change after a time into superficial, spreading ulcerations on the alæ of the nose, more or less concealed beneath furfuraceous scabs. The whole nose is frequently destroyed by the progressive ravages of this peculiar disorder, which sometimes cannot be stopped or retarded by any treatment, external or internal.

The specific ulcerations do not generally extend to the parts far within the nostrils; but, at the time that I am writing this article, there is, under Sir L. Harvey, in St. Bartholomew's Hospital, a curious example, in which the greatest part of the nose is destroyed, and the ulceration proceeds even through the front part of the palate into the mouth. The morbid process sometimes stops for a considerable time, and then is renewed with increased violence. The following case illustrates the nature of *noli me tangere*, and one mode of treatment, to which it yielded. Jane Chatillon, 45 years of age, was attacked, in the course of September, 1788, with an inflammation on the left ala of the nose. Some time afterwards the part ulcerated, which occasioned a troublesome and sometimes a painful itching: different means were unsuccessfully employed, and the case remained nearly in the same situation till the month of September in the following year. At this period, the ulcer spread very fast; the septum nasi, the muscles, and cartilages of both sides, were, in a short space of time, destroyed. The ulceration extended on the left side, on the loose edge of the upper-lip. This was the state of her case on her admission into the Hospital of St. Louis, in the month of October, 1789.

A poultice, moistened with aq. veg. was applied twice a day to the ulcer; a sudorific ptisan prescribed, and a pill, composed of one grain of calomel, and one grain of sulph. aurat. antimonii, ordered to be taken every day. From the fifth day, the inflammation lessened. No other sensible alteration took place till the 21st. The suppuration, that, till this time, had been black and putrid, now became white and inodorous.

On the 37th, the discharge was trifling, and the ulcer being well deterged, was dressed with pledgets, dipped in a solution of verdigris and corrosive sublimate, in the proportion of six grains of each to a pint of water. On the 40th day, cicatrization began to take place, and was finished by the 60th.

Some time before it was completely cicatrized, an issue was made in the arm, which was healed up, without any inconvenience to the patient, six months after the cure. (*Parisian Chirurgical Journal, Vol.* 1.)

One of the best external applications to *noli me tangere* is the following lotion; ℞. Kali arsenicati, gr. iv. Aq. menthæ sativæ ℥iv. Spiritus vini tenuioris ℥j. Misce et cola. I have seen several cases in St. Bartholomew's Hospital, which were either cured or seemed disposed to get well with this useful application. The solution of arsenic, which Sir E. Home has always used, is made by boiling white arsenic in water for several hours, in a sand heat. When given internally, the dose is from three to ten drops; when for external application, a dram is to be diluted with ℔ij. of water; and this solution is gradually made stronger, as the parts become accustomed to it, till it is of double strength. However, this mode of using arsenic is by no means a well regulated one; and Plunket's caustic (see *Arsenic*) for outward employment, is not nearly so neat an application as the abovementioned lotion. At St. Bartholomew's Hospital, arsenic is administered internally in the following formula: ℞. Kali arsenicati gr. ij. Aquæ menthæ sativæ ℥iv. Spiritûs vin. ten. ℥j. Misce et cola. Dosis ʒij. ter quotidie. In this way, the quantity of arsenic is nicely determined. We shall only just add, with regard to this medicine, that, both as an external application and an inward remedy, in cases of *noli me tangere*, it perhaps deserves the highest rank. One scruple of the argentum nitratum, dissolved in half an ounce of distilled water, makes a very good application, which, although generally inferior, in point of efficacy, to arsenical ones, in the present disease, occasionally does good, when nothing else seems to produce any benefit. The above case makes us acquainted with another lotion, which deserves further trial. All fluid remedies must be applied to the part, by dipping little bits of lint in them, placing these on the ulcerations, and covering the whole with a pledget.

The ointments, which seem most likely to prove useful applications to *noli me tangere*, are the unguentum hydrargyri nitrati, the unguentum picis, and unguentum sulphuris. As far as my experience extends, they are generally less efficacious than lotions in the present cases; but, in particular instances, they prove superiorly useful, and it deserves especial notice, that surgeons can often make no progress against this inveterate disease, unless they apply a different sort of dressing every day; sometimes, a lotion; at other times, an ointment. The little ulcers may occasionally be touched with the argentum nitratum. The small furfuraceous scabs, which are continually forming on the part affected, should be softened with a little of the unguentum spermatis ceti, and removed with as much tenderness as possible.

We have already remarked, that arsenic is a good medicine to be given internally, and the best mode of exhibiting it has been already explained. Another medicine, which is often useful in these cases, is what is known by the name of Plummer's pill, or the compound calomel pill. ℞. Hydrargyri Submuriatis, Sulphuris Antimonii præcipitati, singulorum gr. xii. Guaiaci gummi resinæ, gr. xxiv. Saponis quod satis sit. Misce; fiant pilulæ duodecim. Dosis una bis quotidie.—In other instances, we may try the decoctum ulmi, or sarsaparillæ, with one of the following pills thrice a day: ℞. Hydrargyri Submuriatis gr. vj. Succi spissati cicutæ ʒj. Misce; fiant pilulæ duodecim. The hydrargyrus sulphuratus has occasionally been given, as an alterative medicine, for the relief of *noli me tangere*; with what good effect I cannot pretend to say.

In three, or four less severe cases of lupous tubercles on the face, which had made no progress towards ulceration, Dr. Bateman saw the solution of muriate of barytes, taken internally, materially amend the complaint. Sometimes, also, a separation of the diseased parts from the sound has been effected with the knife, or caustic, and the progress of the complaint been stopped. (*Synopsis of Cutaneous Diseases, p.* 296, *Edit.* 3.)

**NYCTALOPIA.** (from *νυξ*, night; and *ωψ*, the eye; or *οπτω*, to see.) An affection of the sight, in which the patient is blind in the day-light, but sees very well at night.

Nyctalopia, *visus nocturnus*, or day-blindness, vulgarly called owl-sight, (says M. Lassus) is an affection in which the patient either cannot see at all, or sees but very feebly, objects, which are in the open day-light, or situations where there is a strong light; but discerns them very well, when they are in a darkish place, or at sunset, or in the night-time, if not immoderately dark. (See *Pathologie Chirurgicale, T.* 2, *p.* 539—540.)

The Greek physicians are divided in their opinions concerning the now uncommon disease of nyctalopia. Hippocrates expressly says, "we call those nyctalopes who see by night." The author of *Defin. Medic.* "that they see nothing in the day-time, but have their sight by night." On the contrary, Paulus Ægineta, and Actuarius are as explicit in asserting, that they have their sight perfect in the day-time, but are blind by night. Ætius is of the same mind, though he is thought to favour the contrary opinion, when he says, "they see better by night than in the day, and if the moon shines they are blind." The author of Isagoge embraces both opinions, when he says, "they call those nyctalopes who, in the day-time, see more obscurely, at the setting of the sun more clearly, but, when it is night, much better; or, on the contrary, by day they see a little, but, in the evening, or at night, they are blind." Galen explains the word by a night-blindness. Pliny, Varro, Nonius, Festus, Celsus, and other Latin writers, give equally opposite definitions of the disorder. Dr. Pye questions, whether these two descriptions of nyctalopia, so diametrically opposite to each other, may not be reconciled by considering the disorder as an intermittent one. The difference then will only consist in the different times of the approach of the disease; that of Hippocrates came on in the morning; that of Ægineta, in the evening; both were expressly periodical, and the distance of time between the paroxysms, in both, was respectively the same; a whole day, or a whole night. The various shapes, in which intermittents appear, very much favour, says Dr. Pye, such an opinion; and the apparent success of bark in the case, which he has related, notwithstanding the unfavourable circumstances of the evacuations his patient laboured under, and the consequent necessity of its disuse, seem to confirm it in this gentleman's mind. (*Med. Obs. and Inq. Vol.* 1.)

In this work, I shall follow Callisen, Richter, and the best modern surgical writers, in calling day-blindness, *nyctalopia*, and night-blindness *hemeralopia.* (See *Callisen, Syst. Chir. Hodiernæ, Vol.* 2, *p.* 362; and *Richter's Anfangsgr. der Wundarzn. B.* 3, *p.* 479.)

Nyctalopia, in the sense of day-blindness, is a very rare disease, in comparison with hemeralopia, which is a very common disorder in warm climates. According to Dr. Hillary, there are a people in Siam, in the East Indies, and also in Africa, who are all of this cat-eyed species, or subject to the disease of being blind in the daytime, and seeing well by night. (*Mod. Univ. Hist. Vol.* 7.) The same author notices the general rarity of the disorder, and mentions his having met with but two examples of it.

With respect to the causes of the complaint, Dr. Hillary observes, that it proceeds from too great a tenderness and sensibility of the iris and retina. M. Lassus thinks the causes may be of different kinds. "If, for instance, (says he) there were a very small opacity, like a point, exactly opposite the pupil, or centre of the crystalline lens, the pupil, contracting in the open daylight, would stop the entrance of the rays of light into the eye, and a day-blindness arise, which would be diminished by the expansion of the pupil in the shade. Here, the cure would depend upon the removal of the opacity.

"Persons, whose pupils do not move freely, but remain much dilated, and do not sufficiently contract in light situations, are also affected with nyctalopia; for, so large a quantity of the rays of light pass into their eyes, that it serves rather to destroy, than assist vision. Such persons see tolerably well, and better than the preceding class of patients, in a darkish place, and they ought to wear green spectacles in the day-time, in order to weaken the impression of the rays of light. When a person is shut up a long while in a dark place, the pupils become habitually dilated, and if he exposes himself suddenly and incautiously to a strong light, the eyesight may be destroyed. There are other individuals, who, from excessive sensibility of the iris, cannot bear much light: their pupils instantly contract, and close. This case (continues M. Lassus) may be brought on by too great an indulgence in venereal pleasures, and in persons, who have debilitated their constitutions during their youth." The same author mentions other cases, which seem to depend upon a species of irritability of the iris. In one instance, an issue in the arm effected a cure, and he mentions the utility of blisters. He admits likewise with Dr. Pye cases of intermittent or periodical nyctalopia, which begin regularly in the morning, and go off in the evening, the patient continuing blind, whether he keep himself in a dark or a light place. The cause of these instances, which, he observes, are very uncommon, is generally seated in the primæ viæ, and requires emetics, resolvents, purgatives, and bark. (See *Pathologie Chirurgicale, Tom.* 2, *p.* 540—542. Also *Richter's Anfangsgr. der Wundarzn. B.* 3. *p.* 481.) In 1787, Baron Larrey met with a case of day-blindness in an old man, one of the galley slaves at Brest, who had been shut up incessantly for thirty-three years in a subterraneous dungeon. His long residence in darkness had had such an effect on the organs of vision, that he could only see in the dark, and was completely blind in the daytime. (See *Mém. de Chir. Militaire, T.* 1, *p.* 6.)

Nyctalopia may perhaps sometimes depend on a peculiarity in the structure and organization of the eye; by reason of which, the quantity of light, which only suffices for vision in an eye of natural formation, proves too abundant for a nyctalops, and absolutely prevents him from seeing at all. We know, that in the eye there is a black substance, named the *pigmentum nigrum*; one supposed use of which is to absorb the redundant rays of light, which enter the pupil. A deficiency of this, may certainly account for a nyctalops being blinded with the day-light, and seeing best at night.

In addition to the few suggestions already offered above, on the mode of curing day-blindness, I have not been able to collect any further information on the subject, worth noticing.

For an account of nyctalopia, in the sense of night-blindness, refer to *Hemeralopia.*

# O.

**ŒDEMA.** (from οιδεω, to swell.) The ancients understood, by this term, all kinds of tumours; but, it is now restricted to a swelling arising from an extravasation of an aqueous fluid in the cellular substance of a particular part; for, when the affection is more extensive, and especially when it is also accompanied with a general dropsical tendency, it then becomes a medical case, and receives the name of *anasarca.* An œdematous part is usually cold, and of a pale colour; and, as it is little, or not at all elastic, it pits, as surgeons express themselves, or, in other words, it retains, for some time, the mark of the finger, after being handled, or pressed. Œdematous swellings are often connected with constitutional causes. In many cases, however, they seem to be entirely local affections, arising from such causes as only act upon the parts, in which the swelling is situated. Thus we observe, that after violent sprains of the wrist, or ankle-joint, the hands and feet often become œdematous; and limbs are frequently affected with œdema, in consequence of the return of blood through the veins being obstructed by the pressure of tumours on them, or that of splints, bandages, &c. Pregnant women are known to be particularly subject to œdema of the legs, owing to the pressure of the gravid uterus on the iliac veins. Persons who have been confined in bed, with fractured thighs, or legs, generally have more or less œdema in their feet and ankles, on first getting up again; and the affection in these cases, is probably quite dependent on loss of tone in the vessels of the limb.

In the treatment of œdema, great attention must always be paid to the nature of the cause, in order to determine whether the disease originates from a mere local, or a general constitutional affection. When it depends on the pressure of a tumour on the veins, as we often see happen in cases of aneurisms, the effect cannot be got rid of till the cause is removed; and the aneurismal swelling must be lessened, before the œdematous one can admit of the same beneficial change. When œdema is the effect of vascular weakness in a limb, in consequence of sprains, contusions, &c. the best means of relief is, to support the parts affected, with a laced stocking, or a flannel roller, while they are also to be rubbed with liniments, and bathed with cold spring water, till they have perfectly recovered their tone.

With regard to the œdema attendant on the advanced state of pregnancy, a complete cure cannot be expected till after delivery. The affection is generally more considerable in the afternoon, than the morning, owing to the different effects of an erect and a recumbent position. Some relief may be obtained by keeping as much as possible in a horizontal posture; and, when much inconvenience and pain are felt, the parts may be fomented with any aromatic or spirituous application.

Œdema is often one of the symptoms of suppuration; and, when the matter is very deeply situated, sometimes leads to its discovery. The truth of this remark is often seen in cases of empyema.

There is a species of œdema accompanied with a degree of heat, pain, &c. in the part, and which, in short, seems combined with phlegmon. In this case, saturnine lotions, the application of leeches, and the exhibition of saline purgatives, are proper. An erysipelatous œdema is also met with, in which the treatment should very much resemble what is explained in the article *Erysipelas.*

**ŒSOPHAGOTOMY.** (from *œsophagus*, and *τεμνω*, to cut.) This operation consists in making an incision into the œsophagus, in order to take out of this tube foreign bodies, which lodge in it, and which can neither be extracted through the mouth, nor pushed down into the stomach, and whose continuance in the œsophagus would occasion fatal symptoms.

As the œsophagus is deeply situated, and covered by very important parts, such as the trachea, nerves, and considerable blood-vessels, every operation, the object of which is to make an opening into this tube, has always been regarded as exceedingly dangerous, and was even, for a long while, quite proscribed. However, although every rational practitioner agrees, that this proceeding should never be resorted to, without some most urgent cause, yet, if a case were to present itself, in which the œsophagus was so obstructed, by some extraneous substance, that no food could absolutely pass into the stomach, or if, in consequence of an accident of the same nature, respiration were impeded in a manner imminently dangerous to life, doubtless the uncertain chance of the operation should be preferred to the certainty of a fatal event without it. Many instances of the œsophagus being accidentally wounded, have been known to end well. Mr. B. Bell saw a man, who, in attempting to kill himself, by cutting his throat, cut through a great part of the trachea into the œsophagus. Bohnius relates the case of a man, wounded in the same way, whose wound in the œsophagus was quite manifest, as every thing which the patient attempted to swallow came out of it. Both the patients, just mentioned, got well, and many similar examples are on record.

Guattani, a surgeon at Rome, published, in the third volume of the *Mem. de l'Acad. de Chirurgie*, a dissertation on the present subject. After explaining the manner of performing this operation, he relates some experiments made on dogs, which succeeded very well. He practised the plan also on the dead subject, in such a manner as to make it demonstrable, that the method was practicable on the human body. What is still more conclusive, the operation was actually done twice, on living subjects, with perfect success. The following is the account of these facts, as recorded in the *Mem. de l'Acad. de Chirurgie.*

"In the month of May, 1738, M. Goursauld, a surgeon at Coussat-Bouneval, in Limousin, was called to a man, who had swallowed a bone, an inch long, and six lines broad. M. Goursauld made various attempts to make this foreign body pass down into the stomach. Not being able to succeed, however, and the bone being felt on the left side, he determined to cut upon it, and try to extract it. An incision having been made, the bone was easily extracted, no bad symptoms followed, and the wound healed, with the aid of an uniting bandage. Care was taken to give the patient no food for six days, but to nourish him with glysters. A similar operation was performed, with equal success, by M. Rolland, surgeon-major of the regiment of Mailly." (*Memoires de l'Académie de Chirurgie, Tom.* 3.)

Guattani, in this memoir, observes, with several other anatomists, that the œsophagus is always situated, not directly between the trachea and vertebræ, but rather more towards the left than the right. This fact would always make a surgeon, when he deems œsophagotomy necessary, undertake it on the left side of the neck. The parts, which cover the œsophagus, from the middle and external part of the neck, to the upper part of the sternum, are the skin, fat, cellular substance, muscles proceeding from the sternum to the larynx, the thyroid gland, the thyroid arteries and veins, the trachea, the recurrent nerve, &c. Things thus circumstanced, Guattani recommends the following mode of operating. "The patient is to sit on a chair, with his head inclined backward, as far as may be thought proper, and held by an assistant, so that it can neither move backward nor forward. The operator, placed before the patient, after pinching up the skin on the right side, into a transverse fold, with the fingers of his left hand, while an assistant does the same to that on the left, is to make, with a straight bistoury, a longitudinal incision in the integuments, from the upper part of the sternum. He is next to divide the cellular substance, fat, &c. which he will find between the left sterno-hyoideus, and sterno-thyroideus muscles, and the trachea. By means of two double blunt hooks, he is to keep the edges of the wound asunder, and, on dividing the cellular substance at the side of the trachea, with his finger and a few strokes of the knife, he will see the œsophagus. A longitudinal incision is then to be made into the lowest part of it, with a straight knife; and this wound must afterwards be dilated upward, with curved, blunt-pointed scissars. If any difficulty should be experienced, the surgeon may employ a director, to facilitate the last object. Small curved forceps, similar to those used for extracting polypi, are then to be introduced into the œsophagus, for the purpose of extracting the extraneous substance. This canal having been opened in the place above specified, the foreign body may be extracted with these forceps, whether it be situated above or below the aperture made for the purpose. This kind of opening will even be useful, when the extraneous substance has passed so far that it cannot be extracted with forceps; for, with a bougie, or some other instrument, it may now be easily pushed down into the stomach.

"The operation finished, the dressing of the wound is a point, which merits a great deal of attention, in regard to the method pursued to unite it. This object has always been accomplished in the animals, on which my experiments were made. If comparative surgery have any weight, it is certainly in such cases as the present one, in which the structure of the part seems to be almost the same. It is also proved by my experiments, that the œsophagus cicatrises very well, without contracting any adhesion to the adjacent parts. It is proper to observe, 1. That the integuments being cut, and the parts disengaged, if, by chance, the vein, which brings back the blood from the inferior part of the thyroid gland, and runs into the left subclavian, should be cut, the hemorrhage may be stopped with a dossil of lint, which is to be compressed by an assistant's finger, during the operation. The vein will afterwards be compressed by the uniting bandage, employed for healing the wound; but, otherwise, a ligature is to be used. 2. That, on separating the lips of the wound, the recurrent nerve may be seen, at a greater or lesser distance from the trachea. If, then, it should be foreseen, that it would be injured in separating the cellular substance, and making the incision into the œsophagus, it must be drawn out of the way, with the same hook which is employed for pulling aside the left lip of the wound. In the same manner, the trachea may be carefully drawn to one side with the right hook, if it should embarrass the operator in finding out the œsophagus; a thing which may be done without fear of seriously interrupting respiration. 3. That the œsophagus is to be opened, as near as possible to the trachea, especially at its upper part, where the arterial branch, which goes from the subclavian, to be distributed to the thyroid gland, sometimes runs. 4. That, if thought proper, the thyroid gland is to be separated from the left side of the trachea, when the foreign body, lodged in the œsophagus, requires a large incision, and, particularly, when this gland is very much swollen, as it would prevent a free view of the œsophagus. 5. That the œsophagus will be known to be opened, when the internal membrane, which is whitish, has been divided. 6. That the operation should be done with promptitude, whenit is thought necessary, in order to avert the unpleasant consequences of inflammation of the œsophagus. 7. That the operation being done, the reunion of the parts is to be promoted, by simple dressings, and the uniting bandage.

"With regard to regimen, besides all the general remedies required in such cases, and every thing which a judicious practice indicates, I am of opinion, that it would be proper (as far as possible) only to give the patient, at intervals, a little broth, for the first three or four days after the operation, so as not to disturb the healing of the parts. And, as broth might cause some little disturbance of the wound, even nourishing glysters, which we know would suffice for the support of the patient this short time, who, in such cases, is not much reduced." (*Guattani, in Mem. de l'Acad. de Chirurgie, Tom.* 3.)

Whenever nourishment is to be conveyed into the stomach, through a wounded œsophagus, a hollow bougie should be introduced, from one of the nostrils, down the passage, and liquid food injected through it, with a syringe.

**ŒSOPHAGUS, FOREIGN BODIES IN.** There are few situations, in which foreign bodies lodge more frequently, than in the œsophagus. The function of this tube explains the reason of this occurrence, and its nearness to the windpipe accounts for the danger of suffocation, whenever a foreign body above a certain size is lodged in it.

Foreign bodies, liable to stick in the œsophagus, are not only food, such as pieces of crust, or meat imperfectly chewed, but also various substances which are accidentally swallowed alone, or with the food, such as little bones, stones, pins, pieces of money, &c. These latter articles, by lodging in the pharynx, or œsophagus, may occasion very bad symptoms; and, if forced down into the stomach, may produce still worse effects. Hence, we should immediately try to extract them. For this purpose, the fingers are to be used, and if they cannot reach them, forceps must be employed. Some have recommended hooks, for the accomplishment of the object in view; others, various instruments, adapted to particular circumstances. The excitement of vomiting has been tried, and occasionally with success; but, it is not free from danger, and the most distressing symptoms have been brought on by it.

When such extraneous substances cannot be extracted, they must be pushed down into the stomach, with some such instrument as a large bougie, or a whalebone probang, fifteen or sixteen inches long; and, on the end of which, a piece of fine sponge is firmly fastened. Small bits of sponge, tied on the ends of some string, have also been used; the patient is to swallow them, and then take some drink. The sponge, expanded with the fluid, dilates the passage, and facilitates the descent of the extraneous substances into the stomach. But, when such bodies are, from their sharp-pointed, angular shape, or hurtful nature, likely to occasion perilous consequences, by being pushed down into the stomach, the plan must not be attempted. Hard, angular substances, and such things as pins and needles, which surgeons have not chosen, or not been able, to force down into the stomach, have often, after a time, made their way to the surface of the body, where an abscess has formed, out of which they have been discharged.

When hard bodies have been pushed, or have got of themselves, down into the alimentary canal, their ill effects should be counteracted, and their passage through the bowels promoted, by giving the patient frequent draughts containing the oleum amygdalarum.

When foreign bodies, in the œsophagus, resist the different means employed for their extraction, or for propelling them into the stomach, where this method has been judged to be proper; when, at the same time, the pain which they occasion is not considerable; when they do not too seriously interrupt respiration, and leave sufficient room for the passage of aliment and drink; it is prudent to abstain from further attempts to displace them. They should be left to nature, while the practitioner should content himself with bleeding the patient a few times, exhibiting draughts containing the oleum amygdalarum, and employing glysters. But, when the lodgment of such foreign bodies dangerously obstructs respiration, by the pressure made on the larynx, an opening must be quickly made in the trachea, in order to serve for a time the office of the natural passage for the air. (See *Bronchotomy.*) As soon as the swelling subsides, another attempt may be made to move the extraneous substance. (See *L'Encyclopédie Méthod. Partie Chir. Art. Corps Etrangers.*)

There may be cases, in which death would certainly result from the continuance of a foreign body in the œsophagus, and if it could neither be extracted nor removed by common means, perhaps cutting into the œsophagus would be proper. (See *Œsophagotomy.*)

When some extraneous substances have been left to themselves, nature has sometimes succeeded in expelling them. They have excited ulceration in the part, where they were lodged, by which they have been loosened, so as then either to be ejected by vomiting, or, after descending into the stomach, to be discharged by stool. In passing any instrument into the œsophagus, the great skill lies in putting it at once directly against the posterior part of the pharynx, so as to avoid touching the epiglottis, and keeping it closely against the vertebræ all the way down. The knowledge of this circumstance may be of infinite service in passing probangs, bougies, &c. but, hollow bougies are introduced in a different way, viz. through one of the nostrils, down the pharynx. When thus employed, they may sometimes be allowed to remain in the passage very advantageously. They are extremely useful for the conveyance of food and medicines into the stomach, when the œsophagus has been wounded; and as the elevation and depression of the larynx, in the action of swallowing, produces immense disturbance of wounds of the trachea, they promise to be of infinite service in the latter cases.

**ŒSOPHAGUS, STRICTURES OF.**

As the œsophagus is required to be wider at one time, and narrower at another, in order to be fitted for conveying the different kinds of food into the stomach, it is nearly under the same circumstance, with respect to the formation of stricture, as the urethra. Strictures in the œsophagus are, for very obvious reasons, much less frequent than in the urethra. However, they are by no means uncommon, and produce symptoms even much more distressing and dangerous, than those, which ordinarily arise from analogous obstructions in the passage for the urine.

This disease has long been noticed by surgical authors, and Mr. Warner in particular has recited an instance of it, that proved fatal, the patient having become incapable of taking nourishment. (See *Cases in Surgery, by J. Warner, F. R. S. p.* 130, *Edit.* 4.)

Of course, the most remarkable symptom of a stricture in the œsophagus, is the difficulty of swallowing, which must be greater or less, according as the obstruction is more or less complete. Sometimes no solid food whatever can pass down into the stomach, and fluids can only descend with great difficulty, and in very small quantities. This is, in some instances, attended with considerable pain, which extends along the fauces to the basis of the skull, and through the eustachian tube to the ear. The pain sometimes returns at intervals, and lasts a considerable time, even when no effort is made to swallow. If a bougie of proper size be introduced down the pharynx, it will often be stopped by the stricture just behind the thyroid, or cricoid cartilage; for, from Sir E. Home's remarks, it appears that the obstruction is generally as high up as this situation. However, there are other cases, in which the obstruction is only of a spasmodic nature, and in these, a bougie may be passed quite down. It is curious, that strictures high up in the œsophagus, often occasion ulceration in this tube very low down towards the stomach, just as strictures in the urethra occasion ulceration in that passage towards the bladder. This is most apt to occur, when strictures of the œsophagus have been of long continuance, and may arise from the efforts in retching, which frequently comes on, and must strain the parts already deprived of their natural actions, and of the benefit of the secretions, with which they are lubricated in a healthy state. When such ulceration takes place, the characters of the original disease are lost; and when the ulceration extends upwards, the stricture itself may be destroyed. A bougie, introduced under such circumstances, will, in general, have its point entangled in the ulcer; and when so skilfully directed as to go down into the œsophagus, it will meet with a difficulty while it is passing the commencement of the ulcerated part of the œsophagus, and another impediment where it leaves the ulcer, and enters the sound portion of the œsophagus below. These two resistances may lead to the supposition, that there are two strictures, while in fact there is not one, only ulceration as above described.

Strictures in the œsophagus are sometimes so complete, that swallowing even fluids is utterly prevented; the patient is obliged to have all nourishment injected *intra anum*, and in general soon perishes in a most emaciated condition.

Though any part of the œsophagus is liable to the kind of contractions forming strictures, the part immediately behind the cricoid cartilage, where the pharynx ends, and the œsophagus begins, is the most frequent seat of the obstruction. Those which are situated further down, do not so easily admit of being examined, and relieved by any surgical operation. Strictures of the œsophagus occupy very little extent of the passage, consist of a transverse fold of the internal membrane, and are attended with little thickening of the adjacent parts. These latter circumstances are such as render the disease capable of receiving relief either from simple or armed bougies.

There are two other diseases of the œsophagus, which have symptoms similar to those of strictures. One is a thickening of the coats of the œsophagus, which extends to the surrounding parts, and generally ends in a cancer, or an incurable disease. The other affection is an ulcer of the lining of the passage, commonly situated a little below the seat of the stricture, on the back part of the tube. In the early state, these diseases can only be distinguished from a stricture, by an examination with a bougie; afterwards their nature becomes clear enough from other symptoms which arise. Strictures also take place more commonly in young subjects; the other two diseases in the more advanced periods of life.

Sir E. Home has found, that a bougie can be more easily introduced into the œsophagus, when the tongue is brought forwards out of the mouth. This gentleman remarks, that when a bougie is passed, with a view of learning the nature of the case, and it passes down to the distance of eight inches, measuring from the cutting edge of the front teeth in the upper jaw, its extremity has gone beyond the usual seat of stricture. If it be withdrawn without any resistance, the aperture in the œsophagus must then be larger than the bougie employed. But if the bougie stops at the distance of six inches and a half, or even lower, it must be retained there with a uniform pressure for half a minute, so as to receive on its point an impression of the surface by which it was opposed. If the end of the bougie retains its natural form, or nearly so, and there is an indentation on one side of it, or all round it, the surgeon may conclude there is a stricture. On the other hand, should the bougie descend without impediment, as far as seven inches and a half, and, when withdrawn, the surface of its point appear irregular and jagged, the disease is an ulcer on the posterior part of the œsophagus.

The mode of treatment adopted by Sir E. Home, consists either in occasionally passing a common bougie through the stricture, and employing one of larger size, in proportion as the dilatation of the obstruction will allow; or else in introducing an armed bougie at convenient intervals. Consult *Practical Observations on the Treatment of Strictures in the Urethra and Œsophagus, Vol.* 1, *Edit.* 3, 1805. *Vol.* 2, 1803, *by Sir E. Home, F. R. S.*

In spasmodic strictures of the œsophagus, blisters have been known to do good, and I have heard a most eminent surgeon express a strong expectation, that other strictures of this passage would be benefited, by feeding the patient through hollow bougies.

**ŒSOPHAGUS, POLYPI OF.** (See *Polypus.*)

**OLEUM CAMPHORATUM.** ℞. Olei Olivæ. ℔j. Camphoræ ℥iv. Misce ut solvatur camphora.

Some practitioners employ this for promoting the suppuration of indolent, particularly scrophulous swellings, which are to be rubbed with the application once, twice, or thrice a day, according to circumstances.

**OLEUM LINI.** In surgery, linseed oil is often used as an application to burns, either alone or mixed with an equal quantity of the aqua calcis. It has also been applied to cancerous ulcers, as some assert, with considerable benefit.

**OLEUM ORIGANI.** The oil of marjoram is often used by surgeons for discussing ganglions: the tumours are to be rubbed with it two or three times a day.

**OLEUM PALMÆ CAMPHORATUM.** ℞. Camphoræ ℥ij. Olei palmæ ℔j. The camphor is to be reduced to powder, and the palm oil, being melted, and suffered to become almost cold, is to be mixed with it in a mortar This application is a mild topical stimulant: it has been used for promoting indolent suppurations, especially those of a scrophulous nature, which take place under the jaw, and are attended with a good deal of chronic induration at their circumference.

**OLEUM RICINI.** In such surgical cases as require the bowels to be opened with the slightest degree of irritation possible, the oleum ricini is the best and safest medicine that can be given. The usual dose is one large table-spoonful, which must be repeated every two or three hours, till the desired effect is produced.

**OLEUM TEREBINTHINÆ.** Oil of turpentine is employed externally as a stimulating liniment, and a styptic. In the article *Liniment* may be seen some formulæ, in which turpentine is the most active ingredient. It is sometimes exhibited by surgeons internally, for the cure of gleets.

**OLEUM TEREBINTHINATUM.** ℞. Olei Amygdalæ ℥ss. Olei Terebinthinæ gutt. xl. Misce.

In deafness, occasioned by defective, or diseased actions of the glandulæ ceruminææ, Mr. Maule directs a little of this oil to be dropped into the patient's ear, or applied at the end of a small dossil of cotton.

When a thin secretion takes place, the cure is also promoted by a small blister, which he orders to be placed as near the ear as convenient, and kept open by the common means. Of course, the savine cerate would now be preferred for this purpose. The meatus auditorius externus must also be cleansed every day with a lengthened bit of soft cotton, affixed to a probe. This is to be introduced into the passage, and twisted gently round, so as to wipe away the discharge. (See *Pharmacop. Chirurgica.*)

**OMPHALOCE'LE.** (from ομφαλος, the navel, and κηλη, a rupture.) A rupture, or hernia at the navel. See *Hernia.*

**ONYCHIA.** (from ονυξ, the nail.) An abscess near the nail of the finger. See *Whitlow.*

**O'NYX.** (from ονυξ, the nail.) A small collection of matter, situated under the cornea, in the anterior chamber of the aqueous humour, and so named from its being shaped like a nail. It is of the same nature as *Hypopium*, to which word I must refer the reader. Maître-Jean, Mauchart, and several other oculists, imply by the term *onyx*, a small abscess between the layers of the cornea.

**OPHTHALMY.** (from οφθαλμος, the eye.) Inflammation of the eye.

Ophthalmy is not only a consequence of several affections of the eye and adjacent parts, on the existence of which its continuance entirely depends; it is frequently, also, the primary complaint, and too frequently the fore-runner, of those irreparable diseases which deprive the patient of vision. Redness of the tunica conjunctiva; tumefaction of the eyelids; aversion to light; lancinating pain in the orbit; an itching, conjoined with a sensation of heat; and an uneasiness, seeming as if it arose from particles of sand in the eye; are symptoms forming the general inconveniences attendant on inflammations of the eye. No part of the eye-ball can be considered as exempt from the attack of inflammation. Hence, in ophthalmy, not only the conjunctiva, the sclerotica, and the choroides, but the retina itself, may also be inflamed, as well as the surrounding parts, the palpebræ, the muscles in the orbit, and the lachrymal gland.

The grand distinctions of ophthalmy are into two species, viz. *acute* and *chronic;* the one arising, as Scarpa says, from an excess of stimulus, and re-action of the living solid; the other connected with debility, which is generally limited to the vessels of the parts affected, but sometimes extends to the whole system. The Arabian authors termed the one *calida*, the other *frigida*. It should be well known, however, that every acute ophthalmy, though treated in the best possible manner, is never so completely resolved, but that beyond a certain period, at which all active disturbance ceases, there yet remains in the conjunctiva, or lining of the eyelids, a degree of chronic ophthalmy, either from local weakness in the vessels, or from a morbid irritability continuing in the eye, after the cure of the acute inflammatory stage. As it occasions a diseased secretion in the organ, and a slow accumulation of blood and coagulating lymph in the part, the inexperienced are apt to suppose, that the acute ophthalmy is not yet subdued, while it is completely so. Immediately the critical moment arrives, when the acute ophthalmy changes into the chronic one, attended with local weakness, it is highly important, in the treatment, to substitute for topical emollient, relaxing applications, such as partake of an astringent, corroborant quality. Those surgeons who now continue to employ the first remedies, only protract the turgescence of the vessels, and the redness of the conjunctiva. *Quo major autem fuit inflammationis vehementia* (says Richter), *eo major plerumque sequitur partium affectarum atonia, eoque major opus est adstringentium et roborantium longo usu, ut auferantur penitùs reliquiæ morbi, &c. Fascicul.* 1, *p.* 109, 110.

*Mild acute ophthalmy* is characterized by redness of the conjunctiva and lining of the eyelids, an unnatural sensation of heat in the eyes, uneasiness, itching and shooting pains, as if sand had got between the palpebræ and eye-ball. At the place where the pain seems most severe, some blood-vessels appear more prominent and turgid, than other vessels of the same class. The patient of his own accord keeps the eyelids closed; for, he feels a weariness and restraint in opening them, and by this means, also, he moderates the action of the light, to which he cannot expose himself, without increasing the burning sensation, lancinating pain, and effusion of tears from the eye. If the constitution is irritable, the pulse will be a little accelerated, particularly towards the evening; the skin will be dry; slight shiverings will occur, and, in some instances, nausea, and inclination to vomit. (*Scarpa.*)

This complaint is often the consequence of a cold, in which the eyes, as well as the pituitary cavities, fauces, and trachea, are affected. It is not unfrequently occasioned by change of weather, sudden transitions from heat to cold, the prevalence of easterly winds, journeys through damp, unhealthy, sandy countries, in the hot season of the year, exposure of the eyes to the vivid rays of the sun, &c. Hence, it does not seem extraordinary, that it should often make its appearence as an epidemic, and afflict persons of every age and sex. Besides the preceding remote causes of ophthalmy, authors have enumerated the suppression of some habitual evacuation, such as bleedings from the nose, or piles, the menses, &c. affections of the primæ viæ, worms, dentition, &c. However, though persons thus circumstanced, are unquestionably subject to inflammation of the eyes, it may be doubted whether they are more so than other people, and when afflicted with ophthalmy, whether the alleged causes have any share in the origin of the complaint.

The mild acute ophthalmy is in general easily cured by means of low diet, gentle purging, with small repeated doses of the antimonium tartarizatum, and after making search for any extraneous body that may have insinuated itself beneath the eyelid, repeatedly washing the eye with a warm decoction of mallow leaves, and covering it with any very soft emollient poultice, included in appropriate little bags of exceedingly fine muslin. The fluid remedy may be most conveniently applied by means of an eye-glass. Scarpa orders the antimonium tartarizatum to be taken as follows: ℞. Antim. tart. gr. j. Decocti Hordei ℔iss. Crystall. tart. ʒj. Sacchari Purif. ʒvj. Misce. To be taken in divided doses every day. I have substituted the barley water for the decoction of dog-grass, which is certainly not essential.

With this treatment, the inflammatory stage of the mild acute ophthalmy, commonly ceases in the course of four or five days. The patient no longer complains of that oppressive sense of heat, tension, throbbing, &c. experienced at first, and he can now bear a moderate light, without such an effusion of tears as was previously occasioned. In this state, how red soever the tunica conjunctiva may appear, it is no longer affected with acute inflammation, and the ophthalmy has changed, from its acute stage, into that attended with relaxation and weakness of the vessels of the conjunctiva, and membranous lining of the eyelids. Emollients are now improper; in lieu of them, astringent, corroborant collyria should be used, by means of which the relaxed vessels of the conjunctiva and eyelid will recover their original tone, and the ophthalmy be totally removed. One of the following eye-waters, which are similar in quality to those directed by Scarpa, may be employed: ℞. *Zinci Sulphatis gr. v. Aquæ Rosæ ℥iv. Misce.* Or ℞. *Cerussæ Acetatæ gr. viij. Aquæ Fœniculi ℥vj. Spiritûs Vini Camphorati gutt. x. Misce.* The mild ophthalmy, originating from causes which render it an epidemic, so quickly passes over the first inflammatory stage, that it is scarcely observable, and is, according to Scarpa, the only case in which cold astringent applications prove in the first instance beneficial.

Surgeons in this country certainly very often employ vitriolated collyria at first, in almost all cases of ophthalmy, and with great benefit; but, it is to be observed, that in general some days have usually elapsed before they are consulted. If the continental surgeons are accurate in their remarks, astringents must be very wrong in the first instance. Richter says;—*Quotidie observo quantum damni adferant oculis inflammatis sueta illa collyria adstringentia, quantum emolumenti emollientia.—Fascicul.* 3, *p.* 101.

*The Severe Acute Ophthalmy*, is attended with the same kind of symptoms as the mild, but in a more aggravated form. The sensation of heat in the eyes is burning; the constriction of the whole eye and eye-lid spasmodic; the presence of even a faint light intolerable. Sometimes the effusion of tears is continual, very copious, and blended with mucus, which is apt to make the eye-lids adhere together. Sometimes this secretion is almost suppressed, and the eyes become preternaturally dry. The sympathetic fever is considerable, with restlessness, and intolerable pain at the back part of the head. The pupil is contracted, the conjunctiva of an uniformly deep red colour. On the anterior hemisphere of the eye, among the most prominent fasciculi of vessels, may be distinguished a delicate vascular net-work, continued from one fasciculus to another, but, all being equally turgid with blood, and coiled as it were together, seem to form a kind of excrescence, which rises above the surface of the eye, and has a tendency to project forwards, beyond the eyelids. (*Scarpa.*)

From the immoderate action of the inflamed vessels, blood is occasionally extravasated into the cellular substance, connecting the tunica conjunctiva with the sclerotica; in consequence of which, the first of these coats, which is naturally loose, becomes enormously distended, and elevated in front of the eye, so as to make the transparent cornea seem quite sunk, and prevent the eye from being completely shut. *Chemosis* is the term usually applied to this sort of case.

The severe acute ophthalmy commonly affects only the outer part of the eyeball; but, sometimes the interior of the eye is alone affected, or at all events, more so than the outer parts. There is little change in the external parts, the patient has immense aversion, even to the faintest light, the iris has a red appearance, the pupil is exceedingly contracted, and the aqueous humour is occasionally red and turbid. From these circumstances, Scarpa thinks it not irrational to suspect, that, in the highest pitch of internal ophthalmy, there may be an extravasation of blood in the chambers of the eye, especially betwixt the choroid and sclerotic coats. Hence, may proceed the termination of the internal ophthalmy in amaurosis, so common, when the case does not end in suppuration.

The severe acute ophthalmy requires the antiphlogistic treatment, in the most rigorous degree. Tardiness in procuring evacuations, especially of blood, too often gives the disease time to advance to the state of chemosis; or else to a condition, in which suppuration, or an extravasation of lymph within the eye, is threatened; while, in other instances, the inflammation degenerates into an obstinate chronic ophthalmy from the extreme weakness produced in the vessels of the conjunctiva. Both general and topical blood-letting should, therefore, be speedily put in execution. Leeches should be applied to the vicinity of the eyelids, especially about the inner canthus, on the vena angularis, where it joins the frontal, deep orbitar, and transverse vein of the face. (*Scarpa.*)

Mr. Ware objects to leeches being put on, or very near the eyelids, as they have sometimes caused a considerable swelling of the lids, and increased, instead of lessening, the irritation. In ordinary cases, this gentleman recommends applying three in the hollow of the temple, about an inch and a half from the outer part of the orbit. There is one mode of bleeding, in cases of ophthalmy, perhaps productive of more benefit than any other, and this probably on account of its acting at once both as a general and topical evacuation; I mean opening the temporal artery. In some instances, it is true, I have seen the surgeon fail in procuring from this source a sufficient quantity of blood; but I have never seen a continuance of bleeding from the wound any longer, than the practitioner himself wished.

There is one particular mode of taking blood from the eye, which, in acute inflammations, has sometimes been very useful. The visible blood-vessels on that part of the conjunctiva, which covers the inside of the eyelids, are much more numerous, than those which are observable on the white of the eye. Hence, in ophthalmy, the inflammation seems greatest on the inside of the eyelids, where the blood-vessels are often not only much increased in number, but also extremely full and turgid. Sometimes, also, the whole inside of the eyelids, particularly of the lower one, is so much enlarged, as to be constantly turned out. In both these cases great benefit has been derived from scarifying the inner surface of these parts with a lancet, by means of which a considerable quantity of blood has been removed. When the upper eyelid is very œdematous in ophthalmy, and its thickness prevents the application of remedies to the eye, a few punctures made on the outside of the lid, near its edge, will cause the discharge of a bloody water, and a very quick subsidence of the swelling. When the tumefaction of the everted eyelids is very considerable, great and speedy relief has been given, by cutting off a piece from the inside of each of them with a pair of curved scissars. (*Ware, p.* 39, 40.)

General bleeding, though copious, and assisted by the topical application of leeches, does not always prove adequate to remove the high degree of inflammation, attendant on chemosis. It is expedient to employ additional means, in order to give exit to the blood effused in the cellular substance, between the conjunctiva and sclerotica, by which the former is raised so much above the level of the cornea. Scarpa recommends, for this purpose, making a circular incision in the conjunctiva, near the margin of the cornea, with a pair of curved scissars. As a lancet, however, makes a cleaner cut than these instruments, it is perhaps preferable for the operation, and scarifications might suffice, both for the discharge of the extravasated blood, and of that distending the vessels of the conjunctiva itself. In chemosis, Mr. Ware says, there cannot be an easier or a more effectual remedy than æther. A few drops are to be poured into the palm of the hand, and diffused over it, which may be immediately done by pressing the other hand against it. The hand is then to be applied to the eye, and kept so close to it that the spirit, as it evaporates, may insinuate itself into the part affected, and act on the extravasated blood, so as to disperse it. In a few instances of chemosis, in which the swelling and inflammation have been considerable, this gentleman has found the following application of singular service: ℞. Interiorum foliorum recentium Lactucæ Sissilis ℥iij. Coque cum aq. pur ℥ss. in balneo mariæ pro semihora; tunc exprimatur succus, et applicetur paululum ad oculos et ad palpebras sæpe in die. (*Ware, p.* 54.)

After general and topical bleeding, aperient medicines, of the most gentle nature, should be administered; soda phosphorata, pulp of tamarinds, cream of tartar, and magnesia vitriolata, are the most proper. When the stomach is affected, Scarpa also recommends an emetic, as being peculiarly beneficial to inflamed eyes.

When bleeding and other evacuations have been practised, the next most useful measure is the application of a blister to the nape of the neck. Scarpa observes, that the skin in this situation, and that behind the ears, sympathise more closely with the eyes than any other part of the integuments. Many practitioners, however, and among them Mr. Ware, prefer blistering the temples. The latter says: "When the leeches have fallen off, and the consequent hemorrhage has ceased, I would advise a blister of the size of half-a-crown, to be applied on the temples, directly over the orifices made by the leeches, and I have found, that the sooner the blister has followed the bleeding, the more efficacious both have proved." When the ophthalmy has been very violent, and resisted the common method, Mr. Ware adds, that the most beneficial effects have also been sometimes produced by the application of a blister large enough to cover the whole head. (*P.* 43, 44.)

At first, topical emollient applications to the eye are most beneficial; such as mallows boiled in new milk; bread and milk poultices; or the soft pulp of a baked apple; all included in fine little muslin bags. Remedies of this description should be renewed at least every two hours. The patient should be directed to observe perfect quietude, and to lie with his head in an elevated position. To keep the eyelids from adhering together, in the night-time, the sperma-ceti cerate is proper. When the ophthalmy is accompanied with a violent pain in the head, Mr. Ware recommends a strong decoction of poppy-heads to be applied as a fomentation. (*P.* 51.)

Under the preceding plan of treatment, the acute stage of severe ophthalmy commonly abates in about a week. The burning heat and darting pains in the eyes, and the febrile disturbance of the constitution subside. The patient is comparatively easy, and regains his appetite. The eyelids lose their tension and wrinkle. A discharge of thick matter takes the place of a secretion of thin serum, or of a preternaturally dry state of the eyes. These organs can now be opened, without experiencing vast irritation from a moderate light. In this state, notwithstanding the eyes may continue red, and the conjunctiva swollen, all evacuations are to be left off, as well as the use of topical emollients, for which latter astringent, corroborant collyria are to be substituted. Scarpa recommends the following application: ℞. Zinci sulphatis gr. vj. Aquæ distillatæ ℥vj. Mucil. sem. cydon. mali ℥j. Spiritûs vini camphor guttas paucas. Misce et cola. This collyrium may be injected, with a syringe, between the eye and eyelids, once every two hours; or the eye may be bathed in it, by means of an eye-cup. Such persons as cannot bear cold applications to the eye, must have the same kind of collyrium a little warmed; but as soon as the irritability is lessened, they may be used cold.

The tinctura thebaica of the old London Dispensatory proves a most efficacious remedy for the second stage of acute ophthalmy, or that connected with weak vascular action in the part affected. Two or three drops may be insinuated, between the eyelids and globe of the eye, twice a day, in common cases; but in others, attended with more sensibility, once will at first be sufficient. The late Mr. Ware, who brought this application into repute, found, that introducing two or three drops of this medicine at the inner canthus, and making them glide gradually over the eye, by gently drawing down the lower eyelid, proves equally beneficial, and less painful, than dropping them at once on the eyeball. Immediately the application is made, it commonly creates a copious flow of tears: a smarting pain, and a sense of heat in the eyes, which inconveniences, however, soon cease, and the eyes become clearer, and feel evidently improved. But notwithstanding every exaggerated assertion, unbiassed surgeons are now quite convinced, that the tinctura thebaica is only a proper application, when the inflammatory action has been previously diminished by blood-letting, aperient medicines, and blisters, and when the action of the vessels has been weakened by the continuance of the disease. Mr. Ware, in recommending it, as a most effectual application, in every species and stage of the disorder, from the most mild and recent, to the most obstinate and inveterate, (*p.* 51.) has certainly been rather too zealous. Scarpa has seen the necessity of limiting the use of the remedy in question, and he has expressly pointed out, that it is only useful, when the violence of the pain, and the aversion to light, have abated. Indeed, Mr Ware himself acknowledged, a little before sanctioning its unlimited employment in all cases, that, in certain instances, in which the complaint is generally recent, the eyes appear shining and glossy, and feel exquisite pain from the rays of light, no relief at all was obtained. (*P.* 48, 49.) See *Tinctura Thebaica.*

Whenever the patient can easily bear a moderate degree of light, all coverings should be removed from the eyes, except a shade of green or black silk. A brighter light should be gradually admitted every day into his chamber, so that he may become habituated, as soon as possible, to the open day-light. Nothing has a greater tendency to keep up and increase the morbid irritability of the eyes, than keeping them unnecessarily long in a dark situation, or covered with compresses and bandages. (*Scarpa.*)

There is a particular species of severe acute ophthalmy, which differs from the common, in appearing with vehement inflammation and swelling of the conjunctiva and eyelids, and being followed by an extraordinary discharge of pus from the eye. It is very common in children at the breast, and is described as attacking adults on the sudden suppression of a gonorrhœa, or on the inadvertent application of the matter of clap to the eyes. These cases must be regarded as complicated with specific morbid action, and not in the light of simple inflammation, free from any diseased principle.

The *Purulent Ophthalmy* of children produces such tumefaction of the eyelids, as almost prevents them from being separated. Should the surgeon succeed in gaining a view of the membrane lining them, it appears wrinkled, and converted into a red villous surface, somewhat like the inner coat of the rectum, when protruded in young children. (*Warner on the Human Eye, page* 42.) Sometimes in the child's fits of crying, the eyelids become everted, and continue so, until rectified by an attendant. No sooner is the first short attack of inflammation past, than there succeeds a discharge of thick yellow matter, truly surprising in quantity, partly secreted from the meibomian glands, but chiefly from that villous, fungus-like surface, into which the lining of the palpebræ seems converted. If the eyelids can be opened, the matter may be seen diffused over the whole surface of the eye, and its confinement, between the swollen eyelids and the eyeball, contributes still more to aggravate the pain, increase the inflammation, and often to induce ulcers, or specks, either over a part or the whole of the cornea. If a speedy check be not put to this distressing malady, it renders the cornea so opaque and thickened, as often to form what is termed *staphyloma.* The cornea has even been known to burst, the humours to be discharged, and the eye to sink into the orbit. The febrile symptoms are at first severe; the infant is continually fretful and restless, and a diarrhœa is not unfrequently concomitant. The affection of the eyes is occasionally accompanied with eruptions on the head, and with marks of a scrophulous constitution. (See *Ware, p.* 138, *&c.*)

The antiphlogistic treatment should be quickly opposed to the progress of the disease. The temporal arteries should be opened, or leeches applied to the temples, or neighbourhood of the eyelids, and a blister put on the nape of the neck or temples. The child should be kept in a cool room, and not covered with much clothes. If no diarrhœa should prevail, it is proper to purge with a little rhubarb or magnesia in syrup of violets.

A surgeon, however, is seldom called in before the first short inflammatory stage has ceased, and an immense discharge of matter from the eyes has commenced. Of course emollient applications must generally not be used. On the contrary, astringents and corroborants are immediately indicated, in order to restore to the vessels of the conjunctiva and eyelids their original tone, to rectify the villous and fungous appearance of the lining of the palpebræ, and thus finally to check the morbid secretion of matter. For this purpose Mr. Ware strongly recommends the *aqua camphorata* of Bates's Dispensatory: ℞. Cupri sulphatis, Bol. Armen. ā ā ℥iv. Camphoræ ℥j. M. & f. pulvis, de quo projice ℥j. in aquæ bullientis ℔iv. amove ab igne, et subsidant fœces. Mr. Ware, in his late *Remarks on Purulent Ophthalmy*, 1808, observes, that he usually directs the aqua camphorata, as follows: ℞. Cupri sulphatis. Bol. Armen. ā ā gr. viij. Camphoræ gr. ij. Misce, et affunde aquæ bullientis ℥viij. Cùm lotio sit frigida, effundatur limpidus liquor, et sæpissimè injiciatur paululum inter oculum et palpebras. This remedy possesses a very styptic quality; but it is much too strong for use before it is diluted; and the degree of its dilution must always be determined by the peculiar circumstance of each case. Mr. Ware ventures to recommend about one dram of it to be mixed with an ounce of cold clear water, as a medium or standard, to be strengthened or weakened as occasion may require. (*P.* 143.) The remedy must be applied by means of a small ivory or pewter syringe, the end of which is a blunt-pointed cone. The extremity of this instrument is to be placed between the edges of the eyelids, in such a manner, that the medicated liquor may be carried over the whole surface of the eye. Thus the matter will be entirely washed away, and enough of the styptic medicine left behind to interrupt and diminish the excessive discharge. According to the quantity of matter, and the rapidity with which it is secreted, the strength of the application, and the frequency of repeating it, must be regulated. In mild recent cases, the lotion may be used once or twice a day, and rather weaker than the above proportions; but, in inveterate cases, it is necessary to apply it once or twice every hour, and to increase its styptic power in proportion; and when the complaint is somewhat relieved, the strength of the lotion may be lessened, and its application be less frequent.

"The reasons for a frequent repetition of the means just mentioned, in bad cases, are, indeed, of the most urgent nature. Until the conjunctiva is somewhat thinned, and the quantity of the discharge diminished, it is impossible to know in what state the eye is; whether it is more or less injured, totally lost, or capable of any relief. The continuance, or extinction, of the sight frequently depends on the space of a few hours: nor can we be relieved from the greatest uncertainty, in these respects, until the cornea becomes visible." (*Ware, p.* 145.)

This gentleman, with every appearance of reason, condemns the use of emollient poultices, which must have a tendency to increase the swelling and relaxation of the conjunctiva. If poultices are preferred, he particularly recommends such as possess a tonic or mild astringent property; as one made of the curds of milk, turned with alum, and an equal part of unguentum sambuci, or axungia porcini. This is to be put on cold, and frequently renewed, without omitting the use of the injection. (*Ware, p.* 147.)

When the secreted matter is glutinous, and makes the eyelids so adherent together that they cannot be opened, after being shut for any length of time, the adhesive matter must be softened with a little fresh butter mixed with warm milk, or by means of any other soft oleaginous liquor, after the poultice is taken off, and before using the lotion. (*P.* 147.)

If the eversion of the eyelids only occurs when the child cries, and then goes off, nothing need be done in addition to the above means. When, however, the eversion is constant, the injection must be repeated more frequently than in other cases; the eyelids put in their natural position, after its use; and an attendant directed to hold on them, with his finger, for some length of time, a compress dipped in the diluted aqua camphorata. (*P.* 148.)

In some cases, when the inside of the eyelids has been very much inflamed, the tinctura thebaica, insinuated between the eye and eyelids, has been useful. If after the morbid secretion is checked, any part of the cornea should be opaque, the unguentum hydrargyri nitrati, melted in a spoon, and applied accurately on the speck, with a fine hair pencil; or Janin's ophthalmic ointment, lowered and used in the same manner; may produce a cure, if the opacity be not of too deep a kind. When the local disease seems to be kept up by a bad habit, alteratives should be exhibited, such as the æthiops mineralis, or small doses of calomel.

The *Purulent Ophthalmy*, arising either from suppression of gonorrhœa, or from the inadvertent conveyance of gonorrhœal matter to the eyes, is said to produce rather a swelling of the conjunctiva, than of the eyelids, which is followed by a discharge of a yellow greenish matter, similar to that of clap. The heat and pain in the eyes are considerable; an aversion to light prevails, and, in some instances, an appearance of hypopion is visible in the anterior chamber of the aqueous humour. When the complaint proceeds from the second cause, it is described as being less severe.

If it be actually true, that, in adults, a species of purulent ophthalmy does originate from the sudden suppression of a gonorrhœa, are we to consider the complaint so produced as a metastasis of the disease from the urethra to the eyes? This ophthalmy does not regularly follow the suppression of gonorrhœa; nay, it is even a rare occurrence: also, when it is decidedly known, that the purulent ophthalmy has arisen from the infection of gonorrhœa, namely, in those instances, in which the matter has been incautiously communicated to the eyes, it appears, that such an affection of these organs, so produced, is different from the one alluded to, inasmuch as it is slower in its progress, and less threatening in its aspect. Hence, there is good reason for supposing, that no metastasis takes place in this species of purulent ophthalmy, supposed to be connected with a suppressed gonorrhœa: but, we must be content with inferring that, if it really has such a cause, it originates from a sympathy, prevailing between the urethra and eyes, and, that the variation of irritability, in different people, is the reason, why it is not an invariable consequence of the sudden stoppage of a gonorrhœa.

The injection of warm oil, the introduction of a bougie into the urethra, and the application of cataplasms to the perinæum, with a view of renewing the discharge from the urethra, form the outline of the practice of those, who place implicit reliance in the suppression of gonorrhœa being the cause of the complaint. The rarity of the occurrence; the frequency of the sudden cessation of the urethral discharge; the possibility of an ophthalmy arising, as well at this particular moment, as at any other, totally independent of the other complaint; cannot fail to raise in a discerning mind a degree of doubt, concerning the veracity of the assigned cause. Besides, admitting, that there is a sympathy, between the urethra and eyes, how are we to ascertain, whether the suppression of gonorrhœa be the cause or the effect of the ophthalmy, supposing that the one ceases, and the other commences, about the same time? Actuated by such reflections, I am induced to dissuade surgeons from adopting any means calculated to renew a discharge of matter from the urethra. When the purulent ophthalmy, in adult subjects, is decidedly occasioned by the actual contact, and infection of gonorrhœal matter, applied accidentally to the eyes, no one has recommended this unnecessary and improper practice.

The first indication, in the treatment of the disease from either cause, is to oppose the violence of the inflammation, and thus resist the destruction of the eye and opacity of the cornea. A copious quantity of blood should be taken away both topically and generally; mild laxatives should be exhibited, and a blister applied to the nape of the neck, or temples. The eyes ought to be often fomented with a decoction of white poppy-heads, and warm milk repeatedly injected beneath the eyelids. To prevent the palpebræ from becoming agglutinated together, during sleep, the sperma-ceti cerate should be smeared on the margins of the tarsi, every night.

When the heat and pain in the eyes, and febrile symptoms have subsided; when an abundant discharge of pus has commenced; all topical emollients are to be relinquished, and a collyrium of Aq. rosæ ℥x, containing Hydrarg. mur. gr. j. used in their place. Scarpa states, that in the ophthalmy, originating from the inadvertent communication of the matter of gonorrhœa to the eyes, applications, in the form of ointment, such as the ung. hydrarg. the unguentum ophthalmicum of Janin, to which might be added the ung. hyd. nitrat. avail more, than fluid remedies. (*Scarpa.*)

*Epidemic, Purulent, Contagious, or Egyptian Ophthalmy.* The latter name has been given, in consequence of the very close resemblance, which this inflammation bears to that, which destroyed the sight of a considerable number of our soldiers in Egypt in 1801. It is very different from an ophthalmy, which, at various times, has been epidemic, in this and other countries, without any purulent discharge from the eyes, which is seldom dangerous to sight, and, in a few days, generally yields to internal antiphlogistic means, and mildly astringent applications. (*Ware on the Epidemical Purulent Ophthalmy, Note,* p. 3; 1808.)

According to Mr. Peach, the patient complains, in the first stage of the disease, of a sensation seeming to arise from sand in his eye; the vessels on the albuginea become suddenly turgid with blood, and the lower palpebræ very vascular. The cases, treated in this recent state, generally yield. But, if very active measures do not arrest the progress of the disease, the second stage appears, when the palpebræ superiores become much enlarged; the eyelids can only be opened with extreme difficulty; and then either a scalding fluid is discharged and excoriates the face, or a flux of thick yellow matter takes place. In this state, it is frequently in our power to stop the progress of the evil; but, if the most decided and active practice be not adopted, the disease reaches the third stage, in which every thing is seldom of any avail in relieving the most distressing symptoms. The cornea now too often becomes ulcerated, and the eye ruptured. (See *Edinb. Med. and Surgical Journal for January*, 1807.)

The Egyptian ophthalmy has occurred to a great extent in the Royal Military Asylum at Chelsea, and Mr. M'Gregor, the surgeon of that Institution, has favoured the public with an excellent description of the disease, and some highly interesting facts and reflections upon the subject. In the Military Asylum, the symptoms of this species of ophthalmy generally made their appearance in the following order: "A considerable degree of itching was first felt in the evening; this was succeeded by a sticking together of the eyelids, principally complained of by the patient on waking in the morning. The eyelids appeared fuller externally, than they naturally are; and on examining their internal surface, this was found inflamed. The sebaceous glands of the tarsi were considerably enlarged, and of a redder colour than usual. The caruncula lachrymalis had a similar appearance.

"In 24 or 30 hours after the appearance of the above-mentioned symptoms, a viscid mucous discharge took place from the internal surface of each eyelid, and lodged at the inner canthus, till the quantity was sufficient to be pressed over the cheek by the motions of the eye. The vessels of the tunica conjunctiva, covering the eyeball, were distended with red blood, and the tunica conjunctiva was generally so thickened, and raised, as to form an elevated border round the transparent cornea. This state was often accompanied with redness of the skin round the eye; which sometimes extended to a considerable distance, and resembled, in colour, and form, very much what takes place in the cowpox pustule, between the 9th and 12th days after inoculation.

"When the purulent discharge was considerable, there was a swelling of the external eyelids, which often prevented the patient from opening them for several days. The discharge also frequently excoriated the cheeks as it trickled down. Exposure to light caused pain. When light was excluded, and the eye kept from motion, pain was seldom much complained of.

"These symptoms in many subsided, without much aid from medicine, in 10, 12, or 14 days; leaving the eye for a considerable time in an irritable state. In several, however, the disease continued for a much longer time, and ulceration took place on the internal surface of the eyelids, and in different parts on the eyeball. If one of those small ulcers happened to be situated on the transparent cornea, it generally, on healing, left a white speck, which, however, in the young subjects, under our care, was commonly soon removed. In some few instances, an abscess took place in the substance of the eye-ball, which, bursting externally, produced irrecoverable blindness." (*P. M'Gregor in Trans. of a Society for the Improvement of Med. and Chirurg. Knowledge, Vol.* 3, *p.* 38—40.)

When the local symptoms had prevailed two or three days, some febrile disturbance occurred; but, except in severe cases, it was scarcely observable.

The principal difference, between the purulent ophthalmy of infants, and that of adults, consists in the different states of the tunica conjunctiva. In the former, notwithstanding the quantity of matter, confined within the eyelids, is often profuse, the inflammation of the conjunctiva is rarely considerable, and whenever the cornea becomes impaired, it is rather owing to the lodgment of such matter on it, than to inflammation. But, in the purulent ophthalmy of adults, the discharge is always accompanied with a violent inflammation, and generally with a tumefaction of the conjunctiva, by which its membranous appearance is destroyed, and the cornea is made to seem sunk in the eye-ball. (*Ware, p.* 23.)

According to Mr. M'Gregor, this ophthalmy is of the same nature with that, which has raged with such violence in the army at different periods since the return of our troops from Egypt in 1800, 1801, and 1802. However, he has found, that its consequences have not been so injurious to children as to adults; for, out of the great number of children, that have been afflicted with the disease at the Military Asylum, only six have lost the sight of both eyes, and twelve the sight of one eye. (*Op. cit. P.* 49.) On the other hand, Dr. Vetch informs us, that, in the second battalion of the 52d Regt.

which consisted of somewhat more, than 700 men, 636 cases of ophthalmia were admitted into the hospital between August 1805 and August 1806; and that "of this number, fifty were dismissed with the loss of both eyes, and forty with that of one." And as Mr. M'Gregor observes, it is a melancholy fact, as appears from the returns of Chelsea and Kilmainham Hospitals, that 2317 soldiers were on the 1st of Dec. 1810, a burthen upon the public, from blindness in consequence of ophthalmia. The cases, in which only one eye was lost, are not here included.

The attacks of the disease appear to be much more frequent, severe, and obstinate, in hot sultry weather, than in cold, or temperate seasons. (*P. M'Gregor, op. cit. p.* 37 —*p.* 54, *&c.*)

This gentleman also observed, that the ophthalmy was more severe and protracted in persons having red hair, or a scrophulous habit, than in others. The right eye was more frequently and violently affected, than the left. In females, the symptoms are greatly aggravated for some days previous to the catamenia; but, on this evacuation taking place, they are quickly lessened. Mr. M'Gregor further remarks, that the measles, cow-pox, and mumps, go through their course as regularly in persons affected with this species of ophthalmia, as when no other disease is present; a circumstance which, with some others, proves that the disorder is entirely local. (*P.* 54—55.)

With respect to the causes of the *Egyptian Purulent Ophthalmy*, much difference of opinion has prevailed, and, indeed, there was a time, when the disease was regarded by the majority of army surgeons, who alone had opportunities of judging of it, as not being in reality *contagious*, but *dependent upon local epidemic causes; peculiarity of climate, &c.* The late Mr. Ware even doubted the propriety of calling this ophthalmy *Egyptian*, and he contended that a disease precisely similar in its symptoms and progress had been noticed long ago in this and other countries; and that, in Egypt, several varieties of ophthalmy prevail. This celebrated oculist preferred calling the disease the *Epidemical Purulent Ophthalmy.*

That there has been long known in this country an infectious species of purulent ophthalmy cannot be doubted. The case, described by many surgeons, as proceeding from the sudden stoppage of gonorrhœa, or the inadvertent application of gonorrhœal matter to the eyes, which disorder I have already noticed, is certainly an infectious purulent ophthalmy. It is also admitted, that it resembles Egyptian Ophthalmy, by the intensity and rapidity of its symptoms; but, the latter case is strongly characterized by the quickness with which it causes, especially in adults, opacities, or ulcerations of the cornea; the long continued irritability of the eyes after the subsidence of inflammation; but, more particularly, its very *infectious,* or *contagious* nature, by which it spreads to an extent, *that has never been observed with regard to any other species of purulent ophthalmy.* There have been epidemic ophthalmies, of other kinds, which have been known to affect the greater part of the population of certain districts and towns in England. The celebrated ophthalmy, which happened at Newbury in Berks, some years ago, is an instance, that must be known to every body. But, I know of no *purulent* inflammation of the eyes, which ever spread to a great extent in England, before the return of our troops from Egypt.

These reflections, and the observations of Mr. M'Gregor, I think, now leave no doubt of two facts; first, that this ophthalmy was brought from Egypt; and, secondly, that it is contagious, or infectious, but only capable of being communicated from one person to another by actual contact of the discharge. Mr. M'Gregor relates three cases, which prove, that the matter, after its application, produces its first effects in a very short time. I shall only cite the following example: On the 25th of October, 1809, about four o'clock P. M. Nurse Flannelly, while syringing the eyes of a boy, let some of the lotion, which had already washed the diseased eyes, pass out of the syringe into her own right eye. She felt little or no smarting at the time; but, towards nine o'clock the same evening, her right eye became red, and somewhat painful, and when she awoke next morning, her eyelids were swelled, there was a purulent discharge, pain, &c. (*Op. cit. p.* 51.)

The late Mr. Ware, though he admitted, that the infection was brought into this country from Egypt by the troops, yet, he conceived, as I think, erroneously, that the same disease also sometimes arose from the matter of gonorrhœa being applied to the eyes, and also that the same disease had been prevalent in this country before the return of the army from Egypt. He thought, however, that the infection was generally communicated by contact. Mr. Ware observes: Some of the worst cases of the purulent ophthalmy of children have happened in those, whose mothers were subject to an acrimonious discharge from the vagina at the time of parturition. Some of the worst forms of the purulent ophthalmy in adults have occurred in those, who, either shortly before the attack of the ophthalmy, or, at that very time, laboured either under a gonorrhœa, or a gleet. Mr. Ware does not mean to impute every purulent ophthalmy to such a cause; but, in the majority of adults, whom he has seen affected, if the disorder had not been produced by the application of morbid matter, from a diseased eye, it could be traced to a connexion, between the ophthalmy, and disease of the urethra. Other causes, Mr. Ware acknowledges, may contribute to aggravate, and, perhaps, produce the disorder, and the purulent ophthalmy in Egypt has been attributed to a great number. The combined influence of heat and light, of a burning dust continually raised by the wind, and of the heavy dews of the night, may powerfully tend to excite inflammations of the eyes. Yet something more must operate in causing the malignant ophthalmy now under consideration; for, the same causes operate with equal violence in some other countries, besides Egypt, and yet do not produce the same effect; and, in this country, (continues Mr. Ware) the disorder prevailed during the last summer, to as great a degree, and upon as great a number of persons, within a small district of less than a mile, as it ever did in Egypt; and, yet, beyond this space, on either side, scarcely a person was affected with it. The disorder was certainly brought into this country by the soldiers who returned from Egypt, and was probably communicated from them to many others. Now as the action of the atmosphere alone cannot account for the spreading of the disease, &c. Mr. Ware is led to believe, that this particular disorder is only communicable by absolute contact; that is, by the application of some part of the discharge, which issues, either from the conjunctiva of an affected eye, or from some other membrane secreting a similar poison, to the conjunctiva of the eye of another person. In schools and nurseries, in consequence of children using the same basins and towels, as others who had the complaint, the disease has been communicated to nearly twenty in one academy. Hence, Mr. Ware censures the indiscriminate use of those articles, in schools, nurseries, hospitals, ships, and barracks. (*P.* 14, 15.)

Whoever reads the account of the Egyptian ophthalmia, as given by Mr. M'Gregor, will be convinced, that the disorder is only communicable by the application of the infectious matter to the eyes. Probably, the common mode of propagation is the inadvertent use of the same towels, or even merely touching the same articles, which have been in the hands of infected persons, who must be supposed occasionally to apply their fingers more or less to the eyelids. In this last way, the commencement of the disease may be accounted for in regiments upon their entering into barracks, which have been quitted by other infected soldiers. "Flies, in warm weather, (says Mr. M'Gregor) are seen in great numbers surrounding patients labouring under ophthalmia; and I much suspect are very frequently the medium, by which the disease is communicated." (*P.* 54.) The matter is observed to be most infectious, when the disease is in an acute state.

There is one very unaccountable fact, connected with the subject of the causes of this ophthalmy. It is well known, that the French soldiers in Egypt suffered as much as our own troops from the affection, and great numbers of them returned to France with the disease in a chronic form. "In many (says M. Roux) the influence of their native climate has sufficed for the removal of all vestige of the disorder. On the contrary, in others, it has continued in a chronic state, either attended with the loss of one, or of both eyes; and many of our invalids remain with the affliction. But, it has not been found, that these soldiers, who returned from Egypt, have ever communicated a contagious ophthalmia, either in regiments, into which many of them have been incorporated; or in invalid houses, where others have obtained their retirement; or in the individuals belonging to the different classes of society. Such is the objection that has been made, and may always be again urged, against the opinions and observations of the English, respecting the Egyptian ophthalmy." (*Roux, Voyage faite à Londres en* 1814, *ou Parallèle de la Chir. Angloise, &c. p.* 49.)

The treatment, recommended by Mr. Peach, consists in bleeding the patient very largely at the commencement of the disorder. Sometimes he took away 60 ounces of blood at once, and whenever there was a disposition to relapse, the lancet was freely used again. He is also an advocate for the employment of the antiphlogistic regimen in every sense of the word. Mr. Peach occasionally found advantage derived from dropping the undulated liquor plumbi acetatis into the eye; but, upon the whole, he disapproved of fluid remedies. (See *Edinb. Med. and Surgical Journal for January* 1807.)

In the cases under Mr. M'Gregor, local applications were found most advantageous. During the inflammatory stage, however, this gentleman also had recourse to antiphlogistic means, spare diet, bleeding, neutral salts, &c. The topical treatment was as follows: Leeches were freely and repeatedly applied near the eye. But while there was much surrounding redness, instead of leeches which created too much irritation, fomentations with a weak decoction of poppy-heads, and a little brandy, were used. A weak solution of acetite of lead, and sulphate of zinc, had mostly a good effect, when applied to the eye. The vinous tincture of opium did not answer the expectations entertained of it. But, of all the remedies, the ung. hydrarg. nitrat.

was found most frequently successful. It was applied by means of a camel-hair pencil, and at first weakened with twice its quantity of lard. The red precipitate, well levigated, and mixed with simple ointment, sometimes answered when the ung. hydrarg. nitrat. failed. Well levigated verdigrease, and a quack medicine, called the golden ointment, proved also sometimes efficacious. (*P.* 41—43.) According to Mr. M'Gregor, blisters behind the ears, and upon the neck, are useful; but hurtful when put nearer to the eye. In cases, where the disease seems to resist antiphlogistic means, and ulceration has commenced on the external surface of the cornea, this gentleman approves of discharging the aqueous humour by a puncture, as advised by Mr. Wardrop.

When the violence of the inflammation has subsided, Mr. M'Gregor recommends the use of Bates's camphorated water, diluted with four, five, or six times its quantity of water. But, the astringent collyrium, from which he saw most good derived, was a solution of the nitrate of silver, in the proportion of half a grain to every ounce of distilled water. In some cases, it may be used stronger.

Tepid sea-water has sometimes proved serviceable in removing the relicks of the complaint. (*P.* 56, *&c.*)

Mr. Ware speaks also in favour of bleeding; but has rarely carried it to the extent, it has been in the army. In weak persons, this gentleman prefers, instead of repeating venesection, topical bleeding, either from the vein, that passes on the side of the nose, or by means of five or six leeches put on the temple. Sometimes, he thinks it better to scarify the inside of the lower eyelid, with the point of a lancet, carried along parallel to, and very near the margin of this part. Mr. Ware objects to pricking the eyelid in an infinite number of places, as very painful, and likely to increase the irritation. The lancet never need be applied more, than twice, and rarely more, than once; and, perhaps, less pain will be occasioned by making the incision with the edge, rather than the point of the lancet. After taking away blood, Mr. Ware says, a large blister on the head, or back, is often useful. Anodynes should be given, with occasional purgatives, and an antiphlogistic regimen. (*Ware on Purulent Ophthalmy*, 1808, *p.* 26, *&c.*)

Dr. Vetch, on the subject of local applications in the present disease, advises keeping the eyes continually covered with linen, dipt in some cooling lotion. In the first stage, he gives the preference to dropping the aqua sapphirina into the eye; afterwards, when the swelling of the eyelids has come on, he prefers the aqua litharg. acet. While the patient is subject to a recurrence of pain, he thinks, the injection of warm water the best application. For the purpose of lessening the swelling of the eyelids, he advises compresses, dipt in the aqua litharg. acet. to be applied with a moderately firm pressure. When the swelling and other symptoms of the second stage have subsided, Dr. Vetch recommends more astringent applications, such as the aqua lithargyri acet. Bates's camphorated water, solutions of alum, and the muriate of mercury. (See *An Account of the Ophthalmia, as it appeared in England since the return of the British Army from Egypt, by John Vetch, M.D.* 1807, *p.* 111.)

Mr. Ware gives the preference to the aqua camphorata, which is to be used exactly in the same way, as was described above, in speaking of the purulent ophthalmy of children. I cannot help thinking, that, if army surgeons had been careful to inject their applications under the eyelids, as advised by Mr. Ware, great benefit would have been produced. In other ways, the effect of the remedies is often lost. When the inflammation has been very great, Mr. Ware has only put four, or five grains, instead of eight, of the cuprum vitriolatum to eight ounces of water; and, while the inflammation is great, he would never advise more than eight grains to this quantity of water. He usually employs the lotion cold, especially in children; but, in some adults, in whom the general fever, and local inflammation have been considerable, he has been obliged to use it warmed. In cases of great pain and swelling, it should be very weak, less often applied, and, sometimes only warm water injected. In such circumstances, Mr. Ware also sanctions fomenting the eye with a flannel, or sponge, wet with a hot decoction of poppy-heads, or mere hot water. When the cornea threatens to burst, this gentleman approves of opening it, in order to discharge the aqueous humour, by making an incision in a place, where the scar will not obstruct vision.

Having now treated of all the principal species of acute ophthalmy, I shall finish this part of the subject with noticing Mr. Wardrop's proposal to puncture the cornea, and let out the aqueous humour in particular states of inflammation of the eyes. This gentleman remarks, that if the eye of a sheep, or ox, be squeezed in the hand, the whole cornea instantly becomes cloudy, and whenever the pressure is removed, this membrane completely regains its transparency.—From this curious phænomenon in the dead eye, it was evident, that, in the living body, the transparency of the cornea might vary according to the degree of its distention; and that, in cases of opacity of the cornea, accompanied with fulness of the eye-ball, its transparency might be restored by the evacuation of the aqueous humour. The cornea is little sensible, and, as every body knows, its wounds are free from danger. Mr. Wardrop soon met with a case, favourable for making the experiment; the cornea was milky and opaque, and the eye-ball distended and prominent, attended with acute inflammatory symptoms. The aqueous humour was discharged by a small incision, and the operation produced not only a removal of the cloudiness of the cornea, but an abatement of the pain, and a sudden check to all the inflammatory symptoms. From the success of this case, Mr. Wardrop was led to perform the operation on others, not only with a view of diminishing the opacity of the cornea, but, also, of alleviating the inflammation. Four interesting cases are related by this gentleman, very much in favour of the practice, when the eye is severely inflamed, attended with fulness of the organ, a cloudy state of the cornea, and a turbidness of the aqueous humour. Mr. Wardrop also advises the operation, whenever there is the smallest quantity of pus, in the anterior chamber, accompanied with violent symptoms of inflammation. He thinks, that, the great and immediate relief, which the method affords, is imputable to the sudden removal of tension; and he performs the operation with a small knife, such as is used for extracting the cataract. The instrument is to be oiled, and introduced, so as to make a wound of its own breadth, at the usual place of making the incision in the extraction of the cataract. By turning the blade a little on its axis, the aqueous humour flows out. (See *Edinb. Med. and Surg. Journal*, *Jan.* 1807.)

Mr. Ware seems to approve of Mr. Wardrop's operation in the *epidemic*, *purulent*, or *Egyptian Ophthalmy*, when, notwithstanding general evacuations, topical bleeding, mildly astringent lotions, and a strict antiphlogistic regimen, the symptoms still continue, and, especially, if the cornea begin to lose its transparency, and a white rim appear round its circumference. Mr. Ware does not object to using a small knife, of the kind, employed in extracting the cataract; but, thinks a lancet will safely answer the purpose, or, what is better, a sharp-pointed couching needle, having a blade somewhat wider than usual, and a groove in its middle. The instrument, he advises, to be introduced about one-tenth of an inch before the connexion of the cornea with the sclerotica, and pushed gently on, parallel to the plane of the iris, until the aqueous humour make its escape. (*Ware on the Purulent Ophthalmy*, *p.* 41, 1808.)

Perhaps, the best mode of putting an immediate stop to the Egyptian ophthalmy, when it prevails extensively in a regiment, which is collected together in a garrison or barracks, is to put the men actually affected, in a detached hospital, and then disperse the rest of the corps as much as possible in separate billets, and separate villages. It is a disease, which only makes great head, when persons are living together in the same building, or within the same walls, in numerous bodies, and only then in the warm season of the year. Dr. Grant, Inspector General of Hospitals to the British Army now in France, has constantly succeeded in keeping the disease from spreading to any great extent in that army, by the judicious plan of recommending infected regiments, not to be kept in barracks and garrisons, but to be dispersed and billeted in different villages and hamlets.

### CHRONIC OPHTHALMY.

Unfavourable peculiarities are met with in practice, which prevent the complete cure of the second stage of acute ophthalmy, or that connected with a weak vascular action in the part affected; whence the protracted disease becomes purely chronic, and threatens the slow destruction of the eye.

These peculiarities may be chiefly referred to three causes: 1. To an increased irritability continuing in the eye after the cessation of acute inflammation. 2. To some other existing affection of the eye, or neighbouring parts, of which the chronic ophthalmy is only an effect. 3. To constitutional disease.

1. That chronic ophthalmy may depend upon a morbid irritability of the eye is evinced, not only from its resisting topical astringents and corroborants, to which the disease from simple relaxation and weakness yields, but from its being exasperated by them, and even by cold water. The patient complains of a sense of weight in the upper eyelid, and restraint in opening it; the conjunctiva has a yellowish cast, and when exposed to the damp cold air, or a brilliant light, or when the patient studies by candle-light, its vessels become injected and turgid with blood. If, in combination with such symptoms, the habit of body be weak and irritable; subject to spasms; hypochondriasis, &c. then, it is manifest, that the chronic ophthalmy is connected with a general impairment of the nervous system.

2. Besides extraneous bodies, lodged between the palpebræ and eye-ball, the inversion of the ciliæ, and hairs, growing from the caruncula lachrymalis; ulcers of the cornea; prolapsus of the iris; herpetic ulcerations of the margins of the eyelids; a morbid secretion from the meibomian glands; a diseased enlargement of the cor-

nea, or of the whole globe of the eye, &c. may occasion and maintain chronic ophthalmy. —It is only my part here to mention such remote causes; for, the particular treatment of them is described in other articles. (See *Cornea, Ulcers of; Iris, Prolapsus of; Lippitudo; Staphyloma; Hydrophthalmy; Trichiasis, &c.*)

3. The cure of the second stage of acute ophthalmy may be retarded by the prevalence of scrophula in the system; or by the small-pox affecting the eyes. Chronic ophthalmy is also sometimes a consequence of lues venerea.

When chronic ophthalmy depends upon preternatural irritability, the internal exhibition of bark with valerian is proper; animal food of easy digestion; gelatinous and farinaceous broths; wine in moderation; gentle exercise; living in salubrious and mild situations; are all severally productive of benefit. Externally, the applications should be of the sedative and corroborant kind; such as aromatic spirituous vapours (from the *spiritus ammon. comp.*) applied to the eye through a funnel, for half an hour, three or four times a day; and the eyelids and eyebrows may also be rubbed with the linimentum camphoræ.

Patients, both during the treatment and after the cure, must refrain from straining the eye, and, immediately the least uneasiness is felt, must desist from exercising it. When they write, or read, it should constantly be in a steady, uniform light, and too little, as well as too much, aggravates the disease. Having once begun to use spectacles, they should never study, or survey minute objects, without them. (*Scarpa.*)

I shall conclude the subject with a few remarks upon the cure of ophthalmy, when connected with constitutional disease.

### SCROPHULOUS OPHTHALMY.

No specific being known for scrophula, the treatment, in this instance, rather consists in preventing the aggravation, than in attempting the radical cure of the complaint. Every thing debilitating is hurtful, as all evacuations; indigestible food; intense study; a sedentary life; damp marshy habitations; uncleanliness; frequent transitions from heat to cold. On the other hand, observing to regulate the action of the bowels with the mildest laxatives; and the administration of bark, either alone or conjoined with the tinct. guaiaci ammoniata, do good. Alterative medicines, and especially Æthiops mineralis, from gr. ss. to gr. xx. in the day, taken for a few weeks uninterruptedly; aqua calcis, in broth or gruel, at first, in the dose of ℥iij. at breakfast, and afterwards the same quantity, twice daily for a few months; together with the uniform observance of good regimen; may tend much to abbreviate the duration of this obstinate species of the disease. (*Scarpa.*)

Mr. Ware has found, that the addition of xx to xxx gr. of the sal polychrestus of the Edinburgh Dispensatory, to each dose of bark, suffices to keep the bowels in a regular state, when there is a tendency to costiveness. In some cases, in which there was little appearance of inflammation, this gentleman found the eyelids so relaxed, and the eyes so irritable, that children would not open their eyes, even in the darkest room. In some of these relaxed cases, very beneficial effects were produced by administering internally small doses of opium, night and morning, to abate the irritability. Sea-bathing is always serviceable in scrophulous ophthalmy, and, probably the mere residence on the sea-coast, and the respiration of the sea-air, may bring about some of those advantages, which have been exclusively attributed to bathing. Friction of the body with a flesh-brush or flannel, should be employed morning and evening.

With regard to topical applications, those of a soft relaxing kind prove injurious, as also retirement into dark situations. Slightly astringent collyria; the ung. tutiæ, and the ung. hyd. nitrat. are proper when there are excoriations upon the eyelids, and when, from their occasional adhesion to each other, there is reason to suspect, that the sebaceous glands secrete an acrimonious fluid. Mr. Ware has also found that one drop of the thebaic tincture, dropped into the eye, once or twice in the course of the day, contributes greatly, both to abate the irritability and to increase the strength of the relaxed vessels. (*On Scropulous Ophthalmy, p.* 26.) The same gentleman has occasionally mixed old verjuice with cold spring-water, at first, in the proportion of one part of the former to six of the latter, and increasing the quantity of verjuice, until sometimes there has been an equal quantity of that and water. All coverings should be removed from the eyes, except a shade of green silk, and patients should be gradually habituated to a stronger light. Good air and exercise always tend to improve scrophulous constitutions, and thus, indirectly, the disease under consideration. Scrophula often disappears spontaneously, as children approach the adult state, and, if we only have it in our power to check its progress in the early stage of life, it seems to wear itself out afterwards, and whatever local effects, it may have produced, often disappear.

As the small pox inoculation has at present almost generally been abandoned by the faculty in favour of the vaccine disease, there seems less occasion now for detailing circumstantially a very obstinate species of ophthalmy, induced by the former complaint. When the small-pox eruption is very abundant in the face, it causes a considerable swelling of this part of the body; the eyelids become tumefied, the eyes redden, and there ensues a discharge of a very thick adhesive matter, which agglutinates the palpebræ together; so that, if no steps be taken, the eyes will continue closed for several days in succession. The matter, confined between the eyelids and globe of the eye, being perhaps of an irritating quality, and injurious from the pressure it occasions on the surrounding parts, seems capable of exciting ulceration of the cornea, and even of irremediably destroying vision. When the pustules of the small-pox in other parts of the body have suppurated, they cicatrize; but, those, which happen within the margin of the cartilage of the eyelids, are prevented from healing by the diseased secretion, which is then made from the meibomian glands, and such ulcers result, as will sometimes last for several years, and even during life, if unremedied by art. (*St. Yves sur les Mal. des Yeux, p.* 216, *Edit.* 12*mo* ) After the employment of the antiphlogistic treatment, should the disease, when treated with topical astringents and corroborants, yet baffle the efforts of the surgeon, setons in the nape of the neck, kept open for a long while, prove one of the most useful remedies. Scarpa has experienced much advantage from giving, every morning and evening, to a child, ten years old, a pill, containing one grain of calomel, one grain of the sulph. aur. antim. and four grains of cicuta in powder. It is obvious, that so potent an alterative, if ever serviceable in this case, will soon evince its efficacy; nor would it be justifiable to sport with the patient's constitution by continuing its use beyond a certain period, unless sanctioned by evident signs of its salutary effects on the disease of the eyes.

When great irritability prevails, a mixture, of three drams of the vinum antimoniale, and one dram of the tinctura thebaica, given in doses of five, or six drops, in any convenient vehicle, and, at the same time, applying externally the vapours of the spiritus ammon. comp to the eye, constitute an excellent plan of treatment. In other cases, saturnine collyria, with a little camphorated spirit of wine, or white wine, in which a little sugar is dissolved; tinct thebaica, Janin's ointment, &c. avail most. This treatment is also applicable to the chronic ophthalmy from measles.

When inveterate ulcers remain upon the edges of the palpebræ, the disease may then be regarded as the psorophthalmy, described by Mr. Ware, and will demand the same method of cure. (See *Psorophthalmy.*)

### VENEREAL CHRONIC OPHTHALMY.

Mr. Hunter entertained doubts, whether any inflammations of the eyes were syphilitic, and he appears to build his opinion upon two circumstances; one is, that if such cases be venereal, the disease is very different from what it is when it attacks other parts, and is attended with more pain, than venereal inflammation arising from an affection of the constitution: the second is, that he never saw these cases attended with such ulceration, as occurs when the complaint invades the mouth, throat, and tongue. (*Hunter on the Venereal, p.* 324.) In regard to the first circumstances, I can accurately state, that in several cases, reputed to have been venereal ophthalmy, which I have seen in St. Bartholomew's Hospital, the pain was by no means severe, or the chief part of the malady. The disorder seemed rather to consist in an impairment of vision, with here and there little distinct plexuses of diluted blood-vessels. If the pain should be actually more severe, than that accompanying other local symptoms of lues venerea, will not the natural sensibility of the eye satisfactorily explain this semblance of a well-marked disease deviating from its determinate character? In support of this observation, may I not remark, that the progress of a venereal bubo in the groin causes greater pain, than the formation of a node on the ulna, or tibia? As to the second reason for supposing no inflammations of the eyes are truly venereal, it cannot be considered as conclusive. Syphilis does not seem invariably to produce ulceration, in every situation, where it invades the human frame, and, in the bones, indeed, it would rather seem, in general, to give rise to a process of a directly different tendency, namely, the formation of nodes; nor does it, according to Mr. Hunter's own sentiments, produce ulceration upon mucous membranes. Scarpa says, the venereal ophthalmy is peculiar in not discovering manifest signs of inflammation, stealing on clandestinely, *without much uneasiness.* It afterwards relaxes the vessels of the conjunctiva and lining of the palpebræ, and changes the secretion of Meibomius's glands. In time it causes ulceration of the margins of the eyelids; the ciliæ fall off, and the cornea grows opaque. In the worst stage, it excites itching in the eyes, which is exasperated at night, and abates in violence towards morning, as do almost all the effects of syphilis. It never attains the state of chemosis.—(*Scarpa.*)

In the few cases, which have fallen under my own observation, the decoct. sar. sap. and hydrarg. mur. have constantly improved the condition of the eye, and, when taken, for a sufficient time, have cured the disease. I do not mean to assert, that these instances were unequivocally venereal ophthalmies, I can only say, that they were reputed to be such, and yielded to the above medicines. In some cases, mezereon, guaiacum, and mercurial frictions, might be tried; and, I believe, in all cases, the use of a collyrium, containing the oxymuriate of mercury, as Scarpa recommends, would assist the operation of internal medicines, in the cure of the disease. When the eyelids are ulcerated, the ung. hydrarg. nitrati, weakened at first by the addition of twice, or thrice its quantity of hog's lard, is the best topical application.

Some interesting observations on the ophthalmy, supposed to be venereal, may be seen in Saunders's Treatise on the Diseases of the Eye; but, having noticed these remarks in another publication, I shall avoid repeating them in the present place.

### INTERMITTENT OPHTHALMY.

There is a description of ophthalmy, the symptoms of which intermit, or at least remit, at stated periods. Mr. Ware has not found bark so useful in this, as in scrophulous ophthalmy; but, he has known the oxymuriate of mercury produce the most beneficial effects, and, sometimes, he has conjoined with its internal exhibition the decoct. sars. comp. (See *Ware on Intermittent Ophthalmy.*)

*On the subject of Ophthalmy, the reader may consult with advantage, Maître-Jean, and St. Yves sur les Mal. des Yeux. Ware on Ophthalmy, Psorophthalmy, and Purulent Eyes of new-born Children : on Scrophulous and Intermittent Ophthalmy; also Additional Remarks on Opththalmy; and Remarks on the Purulent Ophthalmy lately epidemical in this country. There is a masterly account of Ophthalmy in Richter's Anfangsg. der Wundarzn. Band.* 3. *The Edinburgh Med. and Surg. Journal for January* 1807, *contains Mr. Peach's and Mr. Wardrop's remarks. See, also, an Account of Ophthalmy, as it appeared in England, since the return of the British Army from Egypt, by John Vetch, M. D.* 1807. *G. J. Beer, Lehre der Augenkrankheiten,* 8*vo.* 2 *Vols.* 1792. *Also His Bibliotheca Ophthalmica,* 4*to. Wien,* 1796. *But, in particular, the Observations of Scarpa, in cap.* 7, *of his work Sulle Principali Malattie degli Occhi, Venez.* 1802, *merit notice : they have been ably translated by Mr. Briggs. Consult likewise a Treatise on Several Practical Points relative to the Diseases of the Eye, by J. C. Saunders, edited by Dr. Farre,* 1811. *Roux, Voyage fait en Angleterre en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 37, &c. *P. M'Gregor in Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol.* 3, *p.* 30, *&c. Larrey's Mémoires de Chirurgie Militaire, Tom.* 1, *p.* 202, *&c. Lassus, Pathologie Chir. T.* 1, *p.* 48, *et seq. Callisen's Systema Chirurgiæ Hodiernæ, Pars* 1, *p.* 240, *&c. Hafniæ,* 1798.

**OSCHEOCELE.** (from οσχεον, the scrotum, and χηλη, a tumour.) A hernia which has descended into the scrotum.

**OSTEOSARCOMA,** or **OSTEOSARCOSIS.** (from οστεον, a bone, and σαρξ, flesh.) This term signifies the change of a bone into a substance, of the consistence of flesh. Bones are sometimes converted into a soft, lardy, homogeneous substance, resembling a cancerous gland, and it is this affection, to which Boyer thinks, that the appellation ought to be confined.

Callisen seems also to regard the osteosarcosis as a disorder by which the texture of the bones is converted into a fleshy or fatty substance, accompanied with a tendency to carcinoma. (*System. Chirurgiæ Hodiernæ, p.* 204, *Vol.* 2, *Edit.* 1800.) We are to understand by osteosarcoma (says Boyer, an alteration of the osseous structure, in which, after more or less distention, the substance of the bone degenerates, and is transformed into a diversified mass, but, more or less analogous to that of cancer of the soft parts; while the local and general symptoms still more strikingly resemble those of the latter disease. (See *Traité des Mal. Chir. T.* 3, *P.* 587.)

According to this writer, all the bones are liable to such a disease; but, it has been more frequently observed in the bones of the face, those of the base of the skull, the long bones of the limbs, and particularly the ossa innominata, which are perhaps oftener affected, than any other bones of the body. (*Op. cit. p.* 588.)

Foreign surgeons do not appear to entertain precisely the same ideas respecting cancer, which prevail in England : at least, they apply the term to many complaints in which there are no vestiges of a carcinomatous structure, and numerous diseases of an incurable nature receive abroad very indiscriminately the name of cancer. Thus, the French surgeons have not yet distinguished the strongly marked differences between carcinoma and fungus hæmatodes. (See *Roux Parallèle de la Chir. Angloise, &c.*; and the article *Fungus Hæmatodes.*)

Fungous diseases in the antrum expand the bones of the face, make their way out, and present a frightful specimen of disease. This change of the bones, though known to have nothing to do with cancer, (See *Antrum*), is considered by Boyer as a kind of osteosarcoma, proceeding from carcinomatous mischief in the neighbouring soft parts; and this he adduces as an example of his first species of osteosarcoma, or that arising in consequence of previous disease in other parts. In the second species, the disorder commences in the bones, and the soft parts are secondarily affected. In all cases, osteosarcoma comes on with deeply seated pain, which sometimes lasts a considerable time before any swelling is manifest. Sometimes the pain becomes more and more afflicting, and of the lancinating kind, impairing the health even before there is any change in the form of the limb. At length, the swelling takes place, occupying the whole circumference of the member. Its nature and situation are in some measure indicated by its hardness and depth. It is unequal and tuberculated, as it were. Pressure does not lessen its size, nor make the pain worse. The soft parts are still in their natural state. The tumour, however, grows more or less rapidly, and the lancinating pains become more severe. In time, the soft parts themselves inflame, and become painful. Sometimes, the skin ulcerates, and, in this very uncommon case, the sore presents a cancerous appearance. Hectic symptoms are induced, the patient gradually loses his strength, and, at length, falls a victim to the disease.

The alteration, which the structure of the bones undergoes in osteo-sarcoma, (says Boyer) deserves great attention. Most frequently, when the disease has made considerable progress, and the tumour has existed a long while, the bony texture has disappeared more or less completely; in lieu of it, an homogeneous, greyish, yellowish, lard-like substance is found, the surface of a slice of which is smooth, much like that of very hard white of egg, or old cheese, the consistence varying from that of cartilage to that of very thick bouillie. The surrounding soft parts, which have participated in the disease of the bones, are converted into a similar matter; muscles, tendons, periosteum, ligaments, vessels, cellular substance, all are confounded in the same homogeneous mass, and have undergone the same degeneration.

In some examples, the disease is less advanced: portions of the bone are then met with, whose texture and consistence are nearly natural, and which are merely somewhat enlarged. But, in proceeding towards the centre of the disease, the substance of the bone is found softened, and its consistence less than that of cartilage, still manifestly retaining, however, a fibrous texture; while, more deeply, it is converted into a lard-like substance, resembling (says Boyer) that of parts affected with carcinoma. In these tumours, cysts are often found, sometimes containing a fetid ichor,—sometimes a matter like clear bouillie; and, in certain cases, a quantity of semi-transparent, tremulous, gelatinous matter is found in the middle of the lard-like substance. Boyer records an instance, in which nearly the whole humerus was changed into a gelatinous mass. (See *Leçons sur les Mal. des Os, T.* 1, *Chap.* 22.)

The prognosis of this disease must always be unfavourable; for, it is equally incurable, and disposed to bring on fatal consequences, whether Boyer's opinion, concerning its being cancer of the bones, be true, or not. This author notices, that, even after amputation, the complaint almost always recurs. (*P.* 591.) The only chance of relief, however, obviously depends upon the possibility and success of the operation. In the *Traité des Mal. Chir. T.* 3, *p.* 594—605, Boyer records two cases of osteosarcoma; one of the thigh; the other, of the os innominatum. The first patient was saved by amputation. Some further particulars relative to osteosarcoma may be found in *Boyer's Traité des Maladies Chirurgicales, T.* 3; *Haller's Element. Physiol. T.* 8, *p.* 2, *pag.* 5; *S. A. Kulmus, Diss. de Oxostosi Steatomatode Claviculæ: Gedan.* 1732; *S. F. Hundermark, Diss. sistens Osteosteatomatis Casum rariorem; Lips.* 1752; *S. G. Hermann, Diss. de Osteosteatomate, Lips.* 1767; *S. C. Planck, de Osteosarcosi: Tub.* 1781, *&c.*

**OZÆNA.** (from οζη, a stench.) An ulcer situated in the nose, discharging a fetid, purulent matter, and sometimes accompanied with caries of the bones. Some authors have signified, by the term, an ill-conditioned ulcer in the antrum. The first meaning is the original one. The disease is described, as coming on with a trifling tumefaction and redness about the ala nasi, accompanied with a discharge of mucus, with which the nostril becomes obstructed. The matter gradually assumes the appearance of pus, is most copious in the morning, and is sometimes attended with sneezing, and a little bleeding. The ulceration occasionally extends round the ala nasi to the cheek, but, seldom far from the nose, the ala of which, also, it rarely destroys. The ozæna is often connected with scrophulous and venereal complaints. In the latter cases, portions of the ossa spongiosa often come away. After the complete cure of all venereal complaints, an exfoliating dead piece of bone will often keep up symptoms, similar to those of the ozæna, until it is detached. Mr. Pearson remarks, that the ozæna frequently occurs, as a symptom of the chachexia syphyloidea. It may perforate the septum nasi, destroy the ossa spongiosa, and even the ossa nasi. Such mischief is now more frequently the effect of the chachexia syphyloidea, than of lues venerea. The ozæna must not be confounded with abscesses in the upper jawbone. (See *Antrum.*)

The constitutional disease, on which the ozæna generally depends, and which acts as the remote cause, must be relieved, before a cure of the local effect can be expected. The internal medicines, which may be necessary, are preparations of mercury, and antimony; sarsaparilla, elm bark, Peruvian bark, muriated barytes, and muriate of lime. Sea-bathing may also do good, by improving the health. The best external applications are said to be, preparations of copper, zinc, arsenic, mercury, the pulvis sternutatorius, and diluted sulphuric acid. (*Pearson's Principles of Surgery, Chap.* 12.)

# P.

**PANA'RIS.** (from ϖαρα, near, and ονυξ, the nail.) See *Whitlow.*

**PANNUS.** (from ϖενω, to labour.) When two, or three pterygia, of different sizes, occurred on the same eye, with their points directed towards the centre of the cornea, where they met, and covered all the surface of this transparent membrane with a dense pellicle, the ancients named the disease, *pannus.* (*Scarpa, Chap.* 14.)

**PARACENTE'SIS.** (from ϖαρακεντεω, to perforate.) The operation of tapping, or making an opening into the abdomen, thorax, or bladder, for the purpose of discharging the fluid confined in these parts in cases of ascites, empyema, hydrothorax, and retention of urine. Effused blood may also require an opening to be made into the chest; and so may confined air in the instance of emphysema.

### TAPPING, OR PARACENTESIS ABDOMINIS.

When the swelling extends equally over the whole abdomen, the fluid is usually diffused among all the viscera, and is only circumscribed by the boundaries of the peritonæum. The water is occasionally included in different cysts, which are generally formed in one of the ovaries; and, in this case, the tumour, which is produced, is not so uniform, the fluctuation is not so distinct, as in the former instance, at least, this is the case while the disease has not made very great progress. The difference, also, in the consistence of the fluid, may render the fluctuation more, or less difficult of detection. When the water is contained in different cysts, it is frequently thick and gelatinous; but, when it is uniformly diffused all over the cavity of the peritonæum, it is generally thinner, and even quite limpid. Sometimes, a considerable number of hydatids are found floating in the fluid, discharged in cases of ascites.

Whatever may be the efficacy of digitalis, mercury, diuretics, and other evacuants, in ascites, they are rarely of any service in cases of local and encysted dropsies. When such swellings continue to enlarge, notwithstanding the adoption of a few measures, which will presently be suggested, the sooner the fluid is evacuated, the better. It is also well known, that all efforts to produce a radical cure even of dropsies, which are not encysted, too frequently fail. I am decidedly of opinion, however, with Dr. Fothergill, that physicians would meet with much more success, in the treatment of ascites, if they were to recommend paracentesis to be done sooner, than they generally do. This operation is, for the most part, much too long delayed; and during a long space, the bowels are continually suffering, more and more, from the effect of the large quantity of fluid, which oppresses them. What ought to render the practice of early tapping more entitled to approbation, is, that the operation, when done in the situation, we shall presently advise, is perfectly free from danger, attended with very little pain, and need not interrupt the further trial of such medicines, as the physician may place confidence in. Paracentesis only becomes a serious measure, when the disease has existed for a great length of time, and the patient has been much weakened by it. Indeed, there seems much reason to suspect, that the operation should be done, as soon as the tension of the abdomen, and the fluctuation, leave no doubt, concerning the nature of the malady; especially, when the first trials, which have been made of internal remedies, seem to promise no success. Dr. Fothergill has demonstrated by facts, the advantages of this method. On the commencement of an ascites, this celebrated practitioner advised the trial of diuretics and other evacuants. He then adds, that, " if by a reasonable perseverance in this course, no considerable benefit accrues; if the viscera do not evidently appear to be obstructed, and unfit for the purposes of life; if the complaints have not been brought on by a long habitual train of intemperance, and from which there seems little hope of reclaiming the patient; if the strength and time of life are not altogether against us; I desist from medicine, except of the cordial kind; and let the disease proceed, till the operation becomes safely practicable. When this is done, by the moderate use of the warmer diuretics, chalybeates and bitters, also the preparations of squills, in doses below that point, at which the stomach would be affected, I endeavour to prevent the abdomen from filling again." (*Med. Obs. and Inq. Vol.* 4, *p.* 112.) The same author remarks, with regard to encysted dropsies, that tapping sometimes effects a radical cure.

The operation should not only be performed in as early a stage of the disease as is compatible with the safety of the parts within the abdomen, it should also be repeated as soon as the quantity of fluid accumulated again is sufficient to make the puncture practicable without danger. Desault used to tap dropsical patients once a week, and, in many cases, after he had performed the operation two or three times, the disease was stopped.

The great number of times that the operation has been repeated in some individuals is surprising; for instance, forty-one times (*Med. Communications, Vol.* 2.); sixty-five times (*Mead*); one hundred times (*Callisen, Syst. Chir. Hodiernæ, Vol.* 2, *p.* 55.); and even one hundred and fifty-five times (*Phil. Trans. Vol.* 69.)

Whenever a considerable quantity of fluid is suddenly let out of the abdomen by tapping, the quick removal of the pressure of the water off the large blood-vessels, and viscera, may produce swooning, convulsions, and even sudden death. These consequences led the ancients to consider paracentesis as a very dangerous operation, and, when they ventured to perform it, they only let out the water gradually, and at intervals.

Dr. Mead, after considering what might occasion the bad symptoms resulting from too sudden an evacuation of a large quantity of fluid from the abdomen, was led to try what effect external pressure would have in preventing such consequences. This practitioner thought, that, in this way, he might keep up the same degree of pressure, which the fluid made on the viscera. The success, attending some trials of this plan, fully justified the opinion Dr. Mead had conceived; for, when the compression is carefully made, the whole of the water, contained in the abdomen of a dropsical patient, may be safely discharged, as quickly as the surgeon chooses. For this purpose, however, the whole abdomen must be equally compressed, the pressure increased in proportion as the evacuation takes place, and kept up in the same degree, for several days afterwards. In St. Bartholomew's Hospital, while the water is flowing out, the necessary degree of pressure is usually made with a sheet which is put round the abdomen. Two assistants, who hold the ends of the sheet, gradually tighten it, in proportion, as the fluid is discharged. Immediately, after the operation, some folded flannel, sprinkled with spirit of wine, is laid over the whole anterior part of the belly, and covered with a broad linen roller, applied with due tightness round the body. Dr. Monro invented a particular kind of belt, for the purpose; but, though it may be well adapted to the object in view, it is, perhaps, unnecessary, as the above method seems to answer every end.

The instrument used for tapping the abdomen, is called a trocar. (See *Trocar.*)

Of this instrument there are several varieties; but, Richter and many other experienced surgeons, give a decided preference to the common trocar. Most of the modern alterations, which have been made in the construction of trocars, have only tended, says Richter, to render the employment of these instruments more difficult. There is no reason for the ordinary objection, that the common trocar cannot be introduced without considerable force. If the part, into which it is about to be passed, be made tense, very little force will be necessary, especially, if care be taken to rotate the instrument gently, as well as push it forward. Hence, all the inventions, which have originated from this supposed imperfection, are represented by Richter to be entirely useless. He condemns the trocar with a double-edged point, as a bad instrument. The proposal of Mr. Cline to make a puncture with a lancet first, and then to introduce into the opening a blunt-pointed trocar, is alleged to be superfluous. Nay—these innovations are declared to be worse than useless. A cutting instrument is liable to injure blood-vessels, and bring on a weakening degree of hemorrhage; and it is said, that the wound thus made, does not heal so readily, as that made with a common trocar. That sharp-edged instruments are attended with the inconvenience of being apt to wound enlarged veins, and produce an unpleasant degree of hemorrhage, is a truth, of which I have myself met with a convincing example. A female, who had a strong aversion to being tapped with a trocar, prevailed upon me to make the opening with a lancet. The puncture was made in the linea alba, about three inches below the navel. A stream of dark-coloured venous blood continued to run from the wound, the whole time the water was flowing out of the cannula, and did not cease until a compress was applied. The quantity of blood lost could not be less than a pint, or a pint and a half. In many cases, the loss of so much blood would prove fatal to dropsical patients, and is what one must always feel anxious to avoid.

The most convenient position for the operation, is certainly when the patient is sitting in an arm-chair. However, weakness and other circumstances, frequently make it necessary to operate on the patient, as he lies in bed.

Until of late, the place, in which surgeons used to puncture the abdomen, in cases of ascites, was the centre of a line, drawn from the navel to the anterior superior spinous process of the ilium, and, on the left side, which was preferred, in consequence of the liver not being there. The place, for the puncture, was usually marked with ink, and was supposed to be always situated just over a part of the linea semilunaris, where there is no fleshy substance, nor any large blood-vessel, exposed to injury. This calculation, however, was made, without considering, that, in dropsy, the parietes of the abdomen do not yield equally in every situation. On the contrary, it is known, that the front is always more distended, than the lateral parts, and that the recti muscles, in particular, are sometimes very much widened. In consequence of these alterations, induced by the disease, no dependence can be put on any measurement, made with a view of ascertaining the precise situation of the linea semilunaris. The surgeon, who trusts to his being able to introduce the trocar exactly in this place, from any calculation of the above kind, will frequently wound a great thickness of muscle, instead of a part, where the abdominal parietes are thinnest. But, a still stronger objection is to be urged against the practice of attempting to tap in the linea semilunaris. Men, well acquainted with anatomy, have frequently been deceived in their reckoning, and, instead of hitting the intended line with their trocars, they have introduced these instruments through the rectus muscle, and wounded the epigastric artery. Patients have died from this error, with large extravasations of blood in the cavity of the peritonæum. In a dropsical person, who has been tapped, it is to be observed also, that, an effusion of blood in the abdomen will of course more readily take place, in consequence of the parts not being in the same close, compact, state, in which they are in the healthy condition.

Let every prudent practitioner, therefore, henceforth abandon the plan of tapping in the linea semilunaris, and, he may the more easily make up his mind to do so, as there is another place, where the operation may be done with the utmost facility and safety. The linea alba is now commonly preferred by the best surgeons; because, here no muscular fibres need be wounded, the place can be hit with certainty, and no large blood-vessel can be injured. About the middle point, between the navel and pubes, is as good a situation for making the puncture, as can possibly be chosen. The surgeon should introduce the trocar in a steady, firm manner, never in an incautious, sudden way, lest parts contained in the peritonæum should be rashly wounded. For the same reason, immediately the point of the trocar has entered the abdomen, a thing always known at once, by the sudden cessation of resistance to its passing inward, it should be introduced no further, and its office of making a passage for the cannula is already accomplished. The surgeon, consequently, is now to take hold of the cannula with the thumb and index finger of his left hand, and gently insinuate it further into the cavity of the peritonæum, while, with his right hand, he is to withdraw the stilette. The fluid now gushes out, and regularly as it escapes, the sheet, which is round the patient's body, is to be tightened. All the water having been evacuated, a piece of flannel and a roller are to be immediately applied, as above explained, a piece of lint and soap-plaster having been previously applied to the wound.

It is not uncommon for the water suddenly to stop, long before the full quantity is discharged. Sometimes, this happens from a piece of intestine, or omentum, obstructing the cannula. This kind of stoppage may be removed by just introducing a probe or director, and holding the portion of viscus back. When the water is very viscid, the only thing we can do is to introduce a large trocar, if doing so should promise to facilitate the evacuation. Also, when hydatids obstruct the cannula, a larger instrument might allow them to escape. In encysted dropsies, the practitioner, of course, can only let the fluid out of those cavities which he can safely puncture.

When a dropsy of the ovary is very large, it also admits of being tapped in the linea alba; but, in this particular case, it is generally best to make the puncture where the swelling is most prominent. In this disease, the ovary is either converted into one large cavity, filled with fluid, or else it contains several distinct cells. The contents are sometimes exceedingly viscid. In early stages of the case, the tumour is situated towards one side of the abdomen, and seems to ascend out of the pelvis. This kind of progress at once distinguishes the disease from a common ascites, which is attended, from the first, with an equal, gradual, universal swelling of the abdomen. The cyst of the ovary, when it has attained a large size, generally adheres, in different places, to the inner surface of the peritonæum, and, in this state, the whole abdomen often seems uniformly swollen, in consequence of the immense magnitude of the disease. The impairment of the health, arising from the pressure of the viscera, and interruption of their functions, and the great difficulty of breathing, produced by the pressure on the diaphragm, make it necessary to let out the fluid, and paracentesis must be done, in the way already related. The disease is often attended with an almost total stoppage of the secretion of urine. Sometimes, the urine is duly secreted, but a retention occurs, so that the use of the catheter becomes indispensable. Tapping, however, can only be regarded as a palliative measure; the water collects again, the same grievances recur, and the operation must be repeated. While an ovarial dropsy is recent, and even after it has been tapped, some attempts may be made to effect a radical cure. Blistering the surface of the abdomen, keeping up a discharge with the savine cerate, and applying a tight roller, have been known to do good. In France, the celebrated Le Dran laid open the cysts of ovarial dropsies. His patients did not die of the consequent inflammation, and the dropsy, indeed, was cured; but, there remained either a sarcomatous enlargement of the ovary, which continued to increase till death, or else incurable fistulæ, leading into the cyst, were the consequences. The large size of a wound, necessary for this purpose, the danger of inducing inflammation in so extensive a surface, as the cyst of a large ovarial dropsy, and the events of Le Dran's cases, are circumstances, on the whole, which ought to keep the practice from ever being revived.

A still more absurd plan has been attempted, viz. to cure the disease by injections, like hydroceles. I formerly saw two cases, in which port wine and water were injected by the late Mr. Ramsden of St. Bartholomew's Hospital: one patient died very soon afterwards of the inflammation, and the other perished more lingeringly from the same cause. Setons have been tried, without success.

Sometimes, though very seldom, the operation of paracentesis is necessary for giving vent to collections of air in the abdomen. Air, when confined in this manner, is generally contained in the bowels, which it inflates to an enormous size. Instances, however, are related of quantities of air being confined between the peritonæum and intestines: but, in some of these cases, it is said, that the air was known to have escaped through a small hole in some part of the intestinal canal, and, it is probable, that all the other examples were of the same kind. This disease is named *tympanites*, and may render making an opening into the abdomen necessary. Notwithstanding authors generally recommend a small trocar for the purpose, there can be no doubt, that dividing the skin, and making a cautious puncture with a lancet through the linea alba, and peritonæum, would be a preferable mode of proceeding. The abdomen must also be compressed with a sheet, while the air is escaping, and, afterwards, with a roller, just as if the case were an ascites. Even when the air is contained in the bowels, if it should be enormous in quantity, occasion urgent symptoms, and cannot be got rid of in other ways, authors recommend paracentesis.

### PARACENTESIS OF THE THORAX.

The necessity for this operation is indicated, when the heart, or lungs, are oppressed by any kind of fluid confined in the cavity of the chest. Every body knows, that the free and uninterrupted performance of the functions of these organs is essential to the support of life. When the action of these viscera is disturbed by the lodgment of a collection of any kind of fluid in the thorax, no internal medicines can be much depended upon for procuring relief. The only means, from which benefit can be rationally expected, is letting out the fluid, by making an opening in the parietes of the chest.

The nature of the effused fluid can make no difference, in regard to the propriety of discharging it in this manner; and, though some authors have only treated of this operation, as applicable to cases of hydrops pectoris, and empyema, it may also be of the greatest service when air is confined in the chest (see *Emphysema*,) or blood extravasated there (see *Wounds of the Thorax*,) so as to make dangerous pressure on the lungs and diaphragm.

In this place, I shall content myself with describing the best method of performing paracentesis thoracis, referring the reader to the articles just mentioned for information, concerning the particular symptoms and circumstances, which may render the operation proper, and the rest of the surgical treatment peculiar to each affection.

The safest, and most convenient situation, for making an opening into the chest, is between the sixth and seventh true ribs, on either side, as circumstances may render necessary. The surgeon should only recollect, that the two cavities of the pleura are completely distinct from each other, and have no communication whatsoever, so that, if fluid were contained on the left side of the thorax, making an opening into the right cavity would not serve for discharging the accumulated matter. The practitioner should also remember, that, when there is a fluid on both sides of the chest, paracentesis must never be done for the relief of the two collections, at the same time; because, there is great reason to believe, that, as the lungs on one side usually collapse, when there is a free communication between the air and inside of the thorax, they would do so on both sides, were an opening made at the same time into each bag of the pleura. It is hardly necessary to remark, that, in this condition, the patient could not breathe, and would die suffocated. The operation consists, in making an incision, about two inches long, through the integuments, which cover the space between the sixth and seventh true ribs, just where the indigitations of the serratus major anticus muscle meet those of the externus obliquus. Here it is unnecessary to divide any muscular fibres, except those of the intercostal muscles, and, by putting the patient in a proper posture, the opening that is to be made, will be depending enough for any purpose whatsoever. The surgeon, avoiding the lower edge of the upper rib, where the intercostal artery lies, is then cautiously to divide the layers of the intercostal muscles, till he brings the pleura into view; when this membrane is to be very carefully divided with a lancet. The instrument should never be introduced in the least deeply, lest the lungs should be injured. The size of the opening in the pleura should never be larger than necessary. The discharge of blood and matter will of course require a freer aperture, than that of air, or water. If requisite, a cannula may be introduced into the wound, for the purpose of facilitating the evacuation of the fluid, and it may even in some cases, be proper to let this instrument remain in the part, in order to let the water, or pus escape, as often as another accumulation takes place. It is obvious, however, that a cannula, for this object, should only be just long enough to enter the cavity of the pleura, and should have a broad rim to keep it from slipping into the chest. A piece of sticking-plaster would easily fix the cannula, which might be stopped up with a cork, or any other convenient thing, or left open, according as the circumstances of the case, and the judgment of the surgeon, should direct.

The paracentesis of the abdomen, and that of the thorax, are described in all treatises on the operations, and systems of surgery. The works of Sharp, Le Dran, Bertrandi, Callisen, Richter, and Sabatier, are particularly deserving of attention.

For an account of the paracentesis of the bladder, refer to *Bladder, Puncture of.* Consult also *Emphysema, Empyema,* and *Wounds of the Thorax.*

PARAPHYMO'SIS, or PARAPHIMOSIS. (from ϖαϱα, back, and φιμοω, to bridle.) This signifies the case, in which the prepuce is drawn quite behind the glans penis, and cannot be brought forward again. See *Phymosis*, with which it will be considered.

PARONY'CHIA. (from ϖαϱα, near, and ονυξ, the nail.) An abscess at the end of the finger, near the nail. See *Whitlow.*

PAROTID DUCT. Every one acquainted with anatomy, is aware, that behind the jaw, on each side, there is situated a large conglomerate gland, being the principal one of such as are destined to secrete the saliva, with which the cavity of the mouth, and the food, which we swallow, are continually moistened. The parotid duct crosses the cheek, being situated about one-third from the zygoma, and two-thirds from the basis of the jaw. After passing over the masseter muscle, it pierces the buccinator, and terminates in the mouth by a considerable orifice, opposite the space, between the second and third bicuspid grinders of the upper jaw. As soon as it has passed the masseter, it dives deeply into the fat of the cheek, and, as M. Louis observes, makes an angle before it opens into the mouth. (*Mem. de l'Acad. de Chir. tom.* 3, *p.* 457.)

From the situation of the parotid duct, it is liable to be wounded, and this has even been done, by the surgeon's lancet, through ignorance. (See *Monro's Works, p.* 520.) In cases of this kind, the continual escape of the saliva may prevent the wound from healing, and, what is called a *salivary fistula* would be the perpetual consequence, if no steps were taken to afford relief. The parotid duct has sometimes been ruptured by blows. (*Œuvres Chir. de Desault, tom.* 2, *p.* 221.) Cases also occur, in which the face becomes considerably swollen, in consequence of the saliva insinuating itself into the cellular substance, just as the air does in emphysema. Respecting the last circumstance, I shall only just mention, that mischief of this kind must always be prevented from becoming very extensive, by making a depending opening for the ready escape of the fluid.

With regard to the treatment of salivary fistulæ, if the division of the parotid duct is recent, the sides of the wound should be brought into contact, and a steady pressure maintained on that part of the cheek, by means of suitable compresses, and a roller. In this manner, a salivary fistula may often be prevented altogether: either the divided ends of the duct reunite, and the spittle resumes its original course into the mouth; or, what is more probable, the wound in the face heals at every part, with the exception of a small fistulous track, which serves as a continuation of the duct into the inside of the mouth. The latter kind of cure, however, can only take place when the wound extends quite through the cheek; but, the chance of the two portions of the duct uniting, and becoming continuous again, should always be taken in recent cases.

When a salivary fistula is actually formed, a seton, introduced from the external fistulous orifice into the mouth, is a method which seems to have, with justice, the greatest share of approbation. The celebrated Monro adopted this plan with success: he kept in the seton till the channel, which it had formed, had become fistulous, after which it was withdrawn, the external orifice being touched with the argentum nitratum, healed up, and the saliva in future flowed through the artificial fistulous channel into the mouth.

Desault used to practise the seton as follows:—He introduced two fingers of his left hand into the patient's mouth, and placing them between the teeth and the cheek, opposite the fistula, thus kept the integuments tense, and the gums from being injured. He then introduced a small hydrocele trocar, with its cannula, just before the opening of the posterior part of the duct, and pushed through the cheek, in a direction a little inclined forward. An assistant now took hold of the cannula, while Desault withdrew the perforator, and passed through the tube a bit of thread, into the cavity of the mouth. The cannula was next taken out, and a seton, which was then fastened to the end of the thread in the mouth, was drawn from within outward; but not so far as to come between the edges of the external opening, where the thread alone lodged, and this was fastened with sticking-plaster to the outside of the cheek. The outer wound was dressed with lint and compresses. Desault used to change the seton daily, introducing regularly rather a larger one, and taking especial care not to bring it between the edges of the wound, which was afterwards covered with sticking-plaster. He enjoined the patient not to move the jaw much, and only allowed him, for some time, liquid food. In about six weeks he used to omit the seton, leaving in the thread, however, for a little while longer. This being taken away, he used to finish the cure, by touching the little aperture remaining, with caustic.

The making of an artificial passage is one of the most ancient plans of curing salivary fistulæ. Every author has had his particular method of doing it, and numerous variations are to be met with, either in the instrument employed for piercing the cheek, or in the substance intended for maintaining the opening. For the first step of the operation, surgeons sometimes used the actual cautery, as Saviard furnishes us an instance of; sometimes an awl, as Monro did; sometimes a common knife, or lancet; sometimes a straight needle, which drew in the thread after it; but, Desault's trocar generally merits the preference, because the cannula, by remaining in the wound, after the perforator is withdrawn, allows the thread to be introduced, which in every other way, is either difficult to accomplish, or requires the use of several instruments.

For the second step of the operation, viz. keeping the opening distended, cannulæ were employed by Duphénix, who used to make a suture over them; a plan objectionable, inasmuch as it was attended with the inconvenience of a solid body left in the parts, and also that of the instrument being apt to slip into the mouth. The seton, therefore, ought to be preferred, and there can be no doubt that Desault's method is better, than the one followed by Monro. See on this subject, *Monro's Works; Œuvres Chir. de Desault, par Bichat, tom.* 2, *p.* 221. Also *Mém. de l'Acad. de Chir. Tom.* 3.

**PARU'LIS.** (from ϖαρα, near, and ȣλον, the gum.) An inflammation, boil, or abscess in the gums.

**PE'NIS, AMPUTATION OF.** No part of the penis should ever be amputated, on account of a mortification, because the dead portion will be naturally thrown off, and the ulcer heal, without the least occasion for putting the patient to any pain from the employment of the knife. Some cancerous, and fungous diseases, are the cases, in which it is often really proper and necessary to amputate more or less of this part of the body.

However, before a surgeon ventures to do the operation, he ought to be certain, that it is the substance of the penis, which is incurably diseased; for, as that judicious surgeon Callisen remarks, tumours, excrescences, ulcers, and gangrenous mischief, of the prepuce, sometimes present appearances, which may lead an inexperienced practitioner to fancy the whole thickness of the part affected with irremediable disorder, while the glans is actually in a sound state. Hence, whenever the least doubt exists, it is better to remove first the prepuce and skin, in order that the true condition of the glans may be detected. (*Callisen, Systema Chirurgiæ Hodiernæ; Pars Posterior, p.* 420, *Hafniæ,* 1800.)

The old surgeons, fearful of hemorrhage, used sometimes to extirpate a part of the penis, by tying ligatures round it with sufficient tightness to make it mortify and slough off. Thus, Ruysch removed the penis in one instance (See *Observ.* 30.) The plan, however, is exceedingly painful, and notwithstanding the authority of Heister, has been most properly rejected from modern surgery.

The amputation may be done in the following manner:—A circular incision is to be made through the skin, about a finger-breadth from the cancerous part. As Callisen observes, it is hardly ever requisite to draw the skin back, before it is cut; because after the corpora cavernosa are divided, they retract so considerably, that there is always a sufficiency of the integuments. (*Syst. Chir. Hodiernæ, Pars Posterior, p.* 421.) As soon therefore as the circular incision through the skin has been made, the corpora cavernosa and urethra are to be cut through, by one stroke of the knife, on a level with the cut edge of the integuments. Sabatier even advises us to draw the skin towards the glans penis, before we employ the knife, so convinced is he of the inutility of saving any of it, and of the inconveniences, which may result from its lying over and obstructing the orifice of the urethra. His mode of operating is also particularly simple, as he cuts through the integuments, and penis together by one stroke of the knife, without making any preliminary circular division of the skin. (*Médecine Opératoire, Tom.* 2, *p.* 305, *Edit.* 2.)

The bleeding arteries are now to be immediately tied: the chief are, one on the dorsum of the penis, and one in each corpus cavernosum. When a general oozing from the wound still continues, some recommend (*White, Hey, &c.*) applying sponge to its surface; others (*Latta*) finely scraped agaric, with a small proportion of pounded white sugar, or gum arabic. Perhaps, however, finely scraped lint, supported with compresses, would be quite as effectual as any styptics, and, certainly, the latter applications should be avoided, if possible, because stimulating, and productive of pain and inflammation. A surer and preferable method of stopping the oozing of blood, and at the same time of healing the wound, might be to bring the skin forward, over the end of the stump, with two strips of sticking-plaster, after introducing a flexible gum cathether into the continuation of the urethra, so as to keep its orifice unobstructed, and the urine from coming into contact with the wound. There can be little doubt, that the gum catheter would be better than a silver one, or any metallic cannula, commonly advised for the above purposes, because it lies in the passage with less irritation. It is but justice to Callisen to state, that he seems to be one of the few good surgical writers, who have particularly recommended in these cases the elastic gum catheter, in preference to that made of silver. (*Op. cit. p.* 421.) In one case, in which Mr. Hey operated, he made a longitudinal division of the integuments, at the inferior part of the penis, so as to make them cover its extremity without puckering, or laying over the orifice of the urethra. The corpora cavernosa, however, do not readily granulate and unite to the skin by the first intention. (*Hey, p.* 452.) After the first dressings are removed, the part should be dressed with the unguentum spermatis-ceti, or any mild unirritating salve.

In consequence of the introduction of a cannula being neglected, Le Dran mentions his having seen the orifice of the urethra become closed a few hours after the operation, so that the patient could not make water. The orifice of the passage could not be discovered without great difficulty. A lancet being introduced at the point, against which the urine seemed to be forced, a quantity of it gushed out, and, as a cannula was not at hand, a sound was introduced, till one could be procured. (*Traité des Oper. de Chirurgie.*)

Pearson, in his *Practical Observations on Cancerous Complaints,* has treated of this operation: he particularly advises the skin not to be drawn back, because, when saved in this manner, it impedes the free exit of the urine. He likewise disapproves of introducing cannulæ, as creative of pain, and spasms of the urethra, and being moreover unnecessary, since the stream of urine will always preserve the urethra in a permeable state. (*P.* 103.)

*Sharp, Le Dran, Bertrandi, and Sabatier's books on the operations, may be consulted.* Also, *l'Encyclopédie Méthodique; Partie Chir. Art. Verge. Hey's Practical Observations in Surgery, p.* 445. *Pearson on Cancerous Complaints, p.* 103, *&c. Warner's Cases in Surgery, p.* 278, *Edit.* 4.

**PENIS, CANCER OF.** A wart, or a tubercle, on the prepuce, the frænum, or the glans penis, is generally the first symptom, and it often remains in a quiet state for many years. When irritated, however, it becomes painful, and enlarges, sometimes enormously, in a very short time. At the same time, ulceration, and a discharge of sanious fetid matter, take place. The disease sometimes also occasions in the urethra fistulous openings, out of which the urine escapes, and the lymphatic glands in the groin may become affected as the disease advances. Mr. Pearson says, that " cancerous excrescences have a broad base, often more extensive, than their superficies; they seem to germinate deeply from within, or rather to be a continuation of the substance of the part; and, in their progressive state, the contiguous surface has a morbid appearance." What Mr. P. considers as a venereal wart, has a basis smaller, than its surface; its roots have rather a superficial attachment, and the contiguous parts have a natural appearance, (*p.* 97.) Such are this gentleman's marks of discrimination. We might question, however, whether Mr. Pearson, notwithstanding his great opportunities, ever saw a really *venereal* wart. For many years past I have never seen any excrescences of this kind, in St. Bartholomew's hospital, which truly required mercury for their cure, or which, when cured without it, were followed by any inconvenience. If my memory does not fail me, Mr. Abernethy also disbelieves in the doctrine of venereal warts.

Foul, spreading, sloughy ulcers of the penis, should be discriminated from cancer. It is worthy of attention, that almost all the cases of cancer of the penis recorded by Mr. Hey, were attended with a congenital phymosis. The same complication also existed in another example, in which Boyer performed amputation of the penis in la Charité on account of a cancerous affection of the part. In the only two opportunities of doing this operation, which M. Roux has had, the cases were likewise accompanied with a natural phymosis. Hence, this author considers such a state of the prepuce as particularly conducive to cancer of the penis, and earnestly enjoins surgeons to recommend their patients to have the first inconvenience rectified, so that no risk of the other more serious affection may be encountered. (See *Parallèle de la Chirurgie Angloise, &c. p.* 306—307.) I have only seen amputation of the penis done thrice, and, in two of these cases, which were reputed to be cancerous, it did not appear, that any degree of phymosis existed. (See *Pearson on Cancerous Complaints; Hey's Practical Observations in Surgery; Roux, Voyage fait en Angleterre en* 1814, *ou Parallèle de la Chir. Angloise, &c. p.* 306.)

**PERINÆ'UM, FISTULÆ OF.** See *Fistulæ in Perinæo.*

**PE'RNIO** (from ϖερνα, or ϖτερνα, the heel.) A chilblain, especially one on the heel. See *Chilblain.*

**PESSARY.** (from ϖεσσω, to soften.) The intention of pessaries, among the old practitioners, was to hold such medicinal substances, as they wished to apply within the pudenda.

Pessaries are now never made use of, except for preventing a prolapsus of the uterus, or vagina, or for keeping up a very uncommon kind of rupture, explained in the article *Hernia.*

**PHAGEDÆ'NA.** (from φαγω, to eat.) An ulcer, which spreads, and as it were eats away the flesh. Hence, the epithet, *phagedenic*, so common among surgeons.

**PHARYNGOTOMY.** (from φαρυγξ, the pharynx, and τεμνω, to cut.) See *Œsophagotomy.*

**PHARINGO'TOMUS.** (from φαρυγξ, the throat, and τομη, an incision.) An instrument for scarifying the tonsils, and for opening abscesses about the fauces. It was invented by M. Petit, and is nothing more, than a sort of lancet, which is inclosed in a sheath. By means of a spring the point is capable of darting out to a determinate extent, so as to make the necessary wound, without risk of injuring other parts.

**PHLEBO'TOMY.** (from φλεψ, a vein, and τεμνω, to cut.) The operation of opening a vein, for the purpose of taking away blood. See *Bleeding.*

**PHLE'GMON.** (from φλεγω, to burn.) Healthy inflammation. See *Inflammation.*

**PHLOGO'SIS.** (from φλογοω, to inflame.) An inflammation. A flushing.

**PHRENI'TIS.** (from φρενες, the diaphragm, supposed by the ancients to be the seat of the mind.) An inflammation of the brain. Phrenzy.

Inflammation of the brain is a frequent consequence of injuries of the head. There is an increased and disordered state of the sensibility of the whole nervous system; the retina cannot bear the usual stimulus of light; the pupils are contracted; the pulse is frequent and small; the eyes are red and turgid, perhaps in consequence of the ophthalmic artery arising from the internal carotid; the countenance is flushed, and the patient is restless, mutters incoherently, and grows wild and delirious.

Phrenitis is treated on the antiphlogistic plan. Copious bleedings, and other evacuations, are highly proper. The blood should be taken from the temporal arteries. The skin ought to be kept moist with antimonials, and a counter-irritation should be excited on the scalp by blisters.

**PHY'MA.** (from φυω, to grow.) Tubercles comprehend eight genera, and we learn from Dr. Bateman, that, under the genus *phyma*, the late Dr. Willan intended to comprise the terminthus, the epinyctis, the furunculus, and the carbuncle. (See *Bateman's Synopsis of Cutaneous Diseases, p.* 270, *Edit.* 3.) According to Pott, this term was formerly applied to an inflammation near the anus. See *Anus, Abscesses of.*

**PHYMO'SIS,** or rather **PHIMO'SIS.** (from φιμοω, to bind up.) A disease of the penis, in which the prepuce cannot be drawn back, so as to uncover the glans. Both the phymosis, and paraphymosis, according to Mr. Hunter, arise from a thickening of the cellular membrane of the prepuce, in consequence of an irritation, capable of producing considerable and diffused inflammation. A chancre is the most frequent cause; but a mere inflammation and discharge from the glans and prepuce, and also a gonorrhœa, may bring on these affections. The inflammation often runs high, and is frequently of the erisypelatous kind. The cellular membrane being loose, the tumefaction becomes considerable, and the end of the prepuce being a depending part, the serum often lodges in it, and makes it œdematous. A congenital contraction of the aperture of the prepuce is very common, and persons so affected, have a natural and constant phymosis. Such a state of parts (says Mr. Hunter) is often attended with chancres, and it produces very great inconveniences during the treatment. When there is considerable diffused inflammation, a diseased phymosis, similar to the natural one, unavoidably follows; and whether diseased or natural, it may produce the paraphymosis, simply by the prepuce being brought back upon the penis. This tight part, then acting as a ligature round the body of the penis, behind the glans, retards the circulation beyond the constriction, so as to produce an œdematous inflammation on the inverted part of the prepuce.

The *natural* or *congenital* phymosis is so considerable, in some children, that the urine cannot pass with ease; but, the aperture of the prepuce generally becomes larger and larger as they grow older, and the bad consequences, which the phymosis might have occasioned in disease, are thus avoided.

In some persons, especially old men, the prepuce sometimes contracts without any visible cause whatever, and becomes so narrow as to hinder the water from getting out, even after it has got free of the urethra, and, consequently, the whole cavity of the prepuce becomes filled with urine, attended with great pain.

In the phymosis, when the prepuce swells and thickens, more and more of the skin of the penis is drawn forwards over the glans, and the latter part becomes at the same time pushed backward by the swelling against its end. Mr. Hunter says, he has seen the prepuce projecting, from such a cause, more than three inches beyond the glans, and its aperture much diminished.

Mr. Hunter also notices, that the prepuce often becomes, in some degree, inverted, by the inner skin yielding more, than the outer, and the part seems to have a kind of neck, where the outer skin naturally terminates. From the tightness and distention of the parts, the prepuce now cannot be drawn more back, so as to expose any sores, which may be situated under it. This state is frequently productive of bad consequences, especially, when there are chancres behind the glans; for, the glans being between the orifice of the prepuce and the sores, the matter sometimes cannot get a passage forward, between the glans and prepuce, and, consequently, it accumulates behind the corona glandis, so as to form a kind of abscess, which produces ulceration on the inside of the prepuce. This abscess bursts externally, and, the glans often protruding through the opening, the whole prepuce becomes thrown towards the opposite side, and the penis seems to have two terminations. On the other hand, (says Mr. Hunter) if the prepuce is loose and wide, and is either accustomed to be kept back in its sound state, or is pulled back to admit of the chancres being dressed, and is allowed to remain in this situation, till the above tumefaction takes place, the case is then named a *paraphymosis.* Also, when the prepuce is pulled forcibly back, after it is swelled, it is then brought from the state of a phymosis to that of a paraphymosis. The latter case is often attended with worse symptoms, than the former, especially, when it has first been a phymosis. According to Mr. Hunter, the reason of this is, that the aperture of the prepuce is naturally less elastic, than any other part of it: therefore, when the prepuce is pulled back upon the body of the penis, that part grasps it more tightly, than any other portion of the skin of the penis, and more so, according to the inflammation. Hence, there are two swellings of the prepuce, one close to the glans; the other behind the stricture. The constriction is often so great, as to interrupt the circulation beyond it. This increases the swelling, adds to the stricture, and often produces a mortification of the prepuce itself, by which means the whole diseased part, together with the stricture, is sometimes removed, forming, as Hunter ably expresses himself, a natural cure. In many cases, the skin and prepuce are not the only parts affected, adhesions, and even mortification may also take place in the glans, corpora cavernosa, &c. (See *Hunter on the Venereal*, 221, &c.)

### TREATMENT OF PHYMOSIS.

A phymosis should be prevented if possible; therefore, says Mr. Hunter, upon the least signs of a thickening of the prepuce, which is known by its being retracted with difficulty and pain, the patient should be kept quiet; if in bed, so much the better, as in an horizontal position the end of the penis will not be so depending. If confinement in bed cannot be complied with, the end of the penis should be kept up, though this can hardly be done, when the patient is walking about. The object of this is to keep the extravasated fluids from gravitating to the prepuce, which they would hinder from being drawn back even more, than the inflammation itself.

As when there are sores, they cannot be dressed in the common way, injections must frequently be thrown under the prepuce, or the operation for phymosis performed. Mr. Hunter advises mercurial injections; either crude mercury rubbed down with a thick solution of gum-arabic; or calomel with the same, and a proportion of opium; or else a solution of one grain of the hydrarg. mur. in one ounce of water. Mr. Hunter also recommends the application of emollient poultices, with laudanum in them, and, before putting them on the part, to let it hang over the steam of hot water, with a little vinegar and spirits of wine in it.

When, in a case of phymosis, chancres bleed, Mr. Hunter says, the oil of turpentine is the best stimulus for making the vessels contract; but, when the hemorrhage proceeds from irritation, he recommends sedatives. Whatever is used, must be injected under the prepuce. When the inflammation has abated, he advises moving the prepuce occasionally to prevent its becoming adherent to the glans. He says, he has seen the opening of the prepuce, so much contracted from the internal ulcers healing and uniting, that there was hardly any passage for the water. If the passage in the prepuce, so contracted, be in a direct line with the orifice of the urethra, a bougie must be used. If otherwise, the operation of slitting up, or removing part of the prepuce, becomes necessary.

When matter is confined under the prepuce, in the manner above described, Mr. Hunter recommends laying the prepuce open, from the external orifice to the bottom, where the matter lies, as in a sinus, or fistula. However, Mr. Hunter thinks laying open the prepuce for the mere purpose of applying dressings unnecessary, as the sores may be washed with injections by means of a syringe.

The common operation for the phymosis consists in slitting open the prepuce, nearly its whole length in the direction of the penis. This plan is certainly the most eligible, when the matter of a chancre cannot escape from under the prepuce; because circumcision, which many surgeons, since Mr. Hunter's time, have preferred, would not suffice for giving vent to the accumulated pus. In many cases of phymosis, says Mr. Hunter, an operation is improper; for, while the inflammation is very considerable, such a measure might bring on mortification. He acknowledges, however, there are cases, in which a freedom given to the parts would prevent the latter event. When matter is confined under the prepuce, an opening is indispensable, and, if the patient should object to the common operation, an opening should be made with a lancet directly through the prepuce, or else with a caustic. (See *Hunter on the Venereal Disease, p. 232, et seq.*)

When the prepuce is to be slit open, a director is first to be introduced under it, and the division is then to be made with a curved pointed bistoury, from within upward.

Many surgeons object to this operation, because the prepuce continues afterwards in a very deformed state; and they perform circumcision, or amputation of the prepuce, in the following manner. The prepuce is first taken hold of with a pair of forceps, as much of the part being left out, as is judged necessary to be removed. The removal is then accomplished by one sweep of the knife, which, directed by the blades of the forceps, is sure of making the incision in a straight and regular manner. A fine suture is next passed through the edges of the inner and outer portions of the skin of the prepuce, so as to keep them together. The only necessary dressings are lint, and, over it, an emollient poultice.

In nine cases, out of twelve, in which the experienced Mr. Hey has had occasion to amputate the penis for cancerous disease, the patients were also affected with a natural phymosis. (*Pract. Obs. in Surgery.*) M. Roux has noticed the same thing in three similar examples, and therefore as he conceives, that phymosis may be conducive to carcinoma of the penis, he thinks, that it should always be remedied in time. (See *Roux Parallèle de la Chir. Angloise, p. 306.*)

### TREATMENT OF PARAPHYMOSIS.

The removal of the stricture in this case should always be effected, because its continuation is apt to produce a mortification in the parts, between the stricture and the glans. It may be done in two ways; either by compressing with the fingers all the blood out of the swollen glans so as to render this part sufficiently small to allow the constricting prepuce to be brought forward over it, with the aid of the two fingers; or by dividing the stricture with a knife. From the great success, which I have seen attend the first mode, I should not conceive the latter one so frequently necessary, as Mr. Hunter seems to lay down. This operation is always troublesome to accomplish, because the swelling, on each side of the stricture, covers or closes, the tight part, so as to make it difficult to get at it. Mr. Hunter says, the best way is to separate the two swellings, as much as possible, where you mean to cut, so as to expose the constricted part; then take a crooked pointed bistoury, pass it under the constriction, and divide it. None of the swollen skin, on each side, should be cut. The prepuce may now be brought forward, unless it should be thought more convenient, for the purpose of dressing the chancres, to let it remain in its present situation. (See *Hunter on the Venereal Disease*, p. 238, 239.)

The original disease, producing phymosis and paraphymosis, must always be attended to, and the employment of mercury must be necessary, or unnecessary, according to the nature of the affection, of which these are only effects.

PILES. (See *Hemorrhoids.*)

PILULÆ AMMONIARETI CUPRI. ℞. Cupri Ammoniaci gr. xvj. Micæ Panis ℈iv. Aquæ Ammon. q. s. M. fiant pilulæ xxxii. (*Edinb. Disp.*) This is said to be the best form of exhibiting copper internally, which mineral some think worthy of trial in cases of gleets.

PILULÆ ARGENTI NITRATI. ℞. Argenti Nitrati gr. iij. Aquæ Distillatæ gutt. aliquot. Micæ Panis q. s. ut fiant pil. xx. The author of the *Pharmacopœia Chirurgica* suggests the trial of these pills in obstinate leprous, and other cutaneous affections, and phagedenic, anomalous ulcers, connected with constitutional causes. Two, or three may be given twice a day. Dr. Powell gave the argentum nitratum internally, in a case of hydrophobia, but, without any sensible effect. These pills are among the *formulæ selectæ* of Dr. Saunders.

PILULÆ CALOMELANOS. ℞. Calomelanos gr. xij. Conservæ Cynosbati quod satis sit. M. fiant pil. xii. These are the calomel pills in common use. Surgeons give one, or two of them daily, as alteratives, in numerous cases. At Guy's Hospital, they add three grains of the pulvis opiatus to each pill, using syrup, instead of the conserve.

PILULÆ CALOMELANOS CUM CICUTA. ℞. Calomelanos gr. vj. Succi spissati Cicutæ ʒj. M. fiant pil. xii. One may be given thrice a day, in scirrhous, cancerous, scrophulous, and some anomalous diseases, resembling venereal cases.

PILULÆ CALOMELANOS CUM ANTIMONIO TARTARISATO. ℞. Calomelanos ʒj. Antimon. Tart. gr. xv. Opii Pur. ʒss. Syrupi simpl. q. s. fiant pil. lx. One of these is given twice a day, in St. Thomas's Hospital, in cases of diseased joints. As the author of the *Pharm. Chirurg.* adds, they are also of use in herpetic affections, and obstinate ulcers. The union of antimony with quicksilver, according to Dr. G. Fordyce, quickens the specific operation of the latter.

PILULÆ CALOMELANOS COMPOSITÆ. ℞. Calomelanos. Sulph. Antim. Præcip. sing. gr. xii. Guaiaci Gummi Resinæ gr. xxiv. Saponis q. s. M. fiant pil. xii. Similar to Plummer's pills. These are most excellent alteratives, in the dose of one twice a day. In tinea capitis, herpetic affections, and many anomalous diseases, they are exceedingly useful. Some diseased enlargements of the breast, and testicle, seem also to be benefited by them.

PILULÆ CICUTÆ. ℞. Succi Cicutæ ʒss. Pulv. Herb. Cicutæ q. s. fiant pil. lx. These are the hemlock pills in use at Guy's Hospital. Cicuta is occasionally given in scrophulous, cancerous, and venereal cases. The surgeon should begin with small doses, and increase them gradually, till nausea and headach arise. From one, to a great number of these pills may be given, in this manner, every day.

PILULÆ CERUSSÆ ACETATÆ. ℞. Cerussæ Acetatæ gr. xii. Opii Purif. gr. vj. Conserv. Cynosbati q. s. M. fiant pil. xii. One may be given thrice a day. Gleets are, perhaps, the only cases, in which surgeons can employ these pills.

PILULÆ COLOCYNTHIDIS CUM CALOMELANE. ℞. Extracti Colocynth. comp. ℈ij. Calom. gr. xii. Saponis ℈j. Two of these operate as a purgative. They are the pills most frequently employed in the practice of surgery, for the purpose just specified.

PILULÆ CUPRI SULPHATIS. ℞. Cupri Sulphatis gr. xv. Olibani Extracti Cinchonæ, sing. ʒij. Syrup. simpl. q. s. fiant pil. lx. From one to four of these pills may be given in a day, for gleets. (*Pharm. Chirurg.*)

PILULÆ HYDRARGYRI. Of these, I need only observe here, that the usual dose is ten grains. See *Mercury.*

PILULÆ HYDRARGYRI CALCINATI. One grain of this preparation is the dose, which is commonly taken at bedtime. See *Mercury.*

PILULÆ HYDRARGYRI CUM CICUTA. ℞. Hydrargyri purificati drach. j. Arabici gummi pulverisati drach. ij. Succi cicutæ spissati drach. j. Herbæ Cicutæ foliorum, in pulverem tritorum, q. s.

The quicksilver is to be first reduced by triture with the gum-arabic, moistened with a little rain-water. The inspissated juice of hemlock is afterwards to be added, and lastly the powdered leaves in sufficient quantity to make a suitable mass for pills.

These, with a slight variation in the proportion of the hemlock, are the *pilulæ mercuriales* of Plenck, who directs three or four pills, each of three grains, to be given every night and morning.

There are, no doubt, many cases to which this formula must be very suitable; such, for instance, as the enlarged prostate gland, &c.

Dr. Saunders in his *Formulæ Selectæ*

directs equal parts of pil. hydrarg. and succ. cicut. spissat. for these, or such like, purposes. (*Pharm. Chir.*)

**PILULÆ NATRI CUM SAPONE.** ℞. Natri ʒj. Saponis ℈j. M. fiant pil. xii. Four may be given thrice a day, in cases of bronchocele, and indurations of the absorbent glands from scrophula.

**PILULÆ OPII.** These need only be mentioned among such as are of eminent utility in surgery.

**PILULÆ OPII COMPOSITÆ.** ℞. Opii Purif. Camphoræ, sing. ʒi. Antim. Tart. gr. xv. Syrup. Simpl. q. s. fiant pil. lx. Used for alleviating pain, and keeping up a gentle perspiration; are particularly useful in preventing painful erections, in cases of gonorrhœa, chordee, &c. (See *Pharm. Chir.*)

**PILULÆ ZINCI SULPHATIS.** ℞. Zinci Sulphatis, ʒij. Terebinthinæ q. s. fiant pil. lx. One, or two, are occasionally given, in cases of gleets, thrice a day.

**PLANTARIS MUSCLE.** This long slender muscle of the leg is said to be sometimes ruptured, particularly in dancing. The surgeon can do little more, than advise rest, and the same posture of the limb, as in the rupture of the tendo Achillis. (See *Achilles, Tendon of.*)

**POLYPUS.** (from ϖολυς, many, and ϖȣς, a foot.) A kind of tumour, which is generally narrow where it originates, and then becomes wider, somewhat like a pear; which is most commonly met with in the nose, uterus, vagina, and antrum; and which received its name from an erroneous idea, that it usually had several roots, or feet, like polypi, or zoophites.

### POLYPUS OF THE NOSE.

Polypi more frequently grow in the cavity of the nose, from the Schneiderean membrane, than any other situation. Nasal polypi are visibly of different kinds; some being red, soft, and sensible; but, free from pain, and exactly like a piece of healthy flesh. This, which has been termed the *fleshy polypus*, is the most common, and fortunately the most easy of cure. Other polypi are called *malignant*, being hard, scirrhous, and painful: some are said to be even capable of conversion into carcinoma. Richter describes another kind of nasal polypus, which is pale, very tough, and secretes a viscid discharge; which undergoes an alteration of its size with every change of the weather; and which is rather a relaxation, or elongation, of a part of the Schneiderean membrane, than a polypous excrescence. The whole membranous lining of the nostrils is sometimes relaxed, and thickened in this manner, so as nearly to fill up all the cavity of the nose. (*Anfangsgr. der Wundarzn. Band.* 1. *Cap.* 21.)

Mr. Pott has taken great pains to shew, that there is one kind of polypus, originally *benign*; another originally *malignant.* He states, that those, which begin with, or are preceded by considerable, or frequent pain in the forehead and upper part of the nose, and which, as soon as they can be seen, are either highly red, or of a dark purple colour; those which, from the time of their being first noticed, have never been observed to be sometimes bigger, sometimes less, but have constantly rather increased; those, in which coughing, sneezing, or blowing the nose, gives pain, or produces a very disagreeable sensation in the nostril, or forehead; those which, when within reach, are painful to the touch, or which, upon being slightly touched, are apt to bleed; those which seem to be fixed, and not moveable by the action of blowing the nose, or of driving the air through the affected nostril only (when the polypus is only on one side); those which are incompressibly hard, and which, when pressed, occasion pain in the corner of the eye, and forehead, and which, if they shed any thing, shed blood; those which, by adhesion, occupy a very considerable space, and seem to consist of a thickening, or of an enlargement of all the membrane covering the septum narium; those which sometimes shed an ichorous, offensive, discoloured discharge; and those, round whose lower part, within the nose, a probe cannot easily and freely be passed, and that, to some height, ought not to be attempted, at least by the forceps, nor indeed by any other means; and this for reasons obviously deducible from the nature and circumstances of the polypus. On the one hand, the very large extent and quantity of adhesion will render extirpation impracticable, even if the disease could be comprehended within the forceps, which it very frequently cannot; and on the other, the malign nature of the distemper may render all partial removal, all unsuccessful attacks on it, and indeed any degree of irritation, productive of the most disagreeable consequences.

But, the polypi, which are of a palish or greyish light-brown colour, or look like a membrane just going to be sloughy; which are seldom or never painful, nor become so upon being pressed; which have appeared to be at one time larger, at another less, as the air has happened to be moist or dry; which ascend and descend freely by the action of respiration through the nose; which the patient can make to descend by stopping the nostril which is free, or even most free, and then driving the air through that which the polypus possesses; which when pressed give no pain, easily yield to such pressure, become flat thereby, and distil a clear lymph; and round whose lower and visible part a probe can easily, and that to some height, be passed, are fair and fit for extraction; the polypus, in these circumstances, frequently coming away intire; or if it does not, yet it is removable without pain, hemorrhage, or hazard, of any kind; the second of which circumstances Mr. Pott can with strict truth affirm, he never yet met with when the disease was at all fit for the operation.

Of the benign kind of polypus, fit for extraction, there are (says Mr. Pott) two sorts, whose principal difference from each other consists in their different origin or attachment. That which is most freely moveable within the nostril, upon forcible respiration; which has been found to be most liable to change of size, at different times and seasons; which has increased the most in the same space of time; which seems most limpid, and most freely yields lymph upon pressure, has its origin most commonly by a stalk, or kind of peduncle, which is very small, compared with the size of the polypus. The other which, although plainly moveable, is much less so, than the one just mentioned, which has been less liable to alteration from air and seasons; and which has been rather slow in arriving at a very troublesome size, is most frequently an elongation of the membrane covering one of the ossa spongiosa. These latter may be extracted with no kind of hazard, and, with very little pain, and hemorrhage: but the former require the least force, and mostly come away entire; while the others often break, come away piecemeal, and stand in need of the repeated use of the forceps. (*Pott on the Polypus of the Nose.*)

Mr. John Bell criticises the distinctions drawn by the preceding writer, and he says, that a polypus is never mild, and never malignant; time, and the natural growth of the tumour, and the pressure it occasions within the soft and bony cells of the nostrils and jaws, must bring every polypus to one invariable form, in its last and fatal stage. Polypus, says Mr. John Bell, is indeed a dreadful disease; but, it becomes so by a slow progression, and advances by gradations easily characterised. Every polypus in its early stage is, according to this writer, a small moveable tumour, attended with a sneezing and watering of the eyes; swelling in moist weather; descending with the breath; but, easily repressed with the point of the finger. It is void of pain, and not at all alarming; it may also be easily extracted, so as to clear for a time the passage for the breath. Yet this little tumour, simple as it may appear, is the germ of a very fatal and loathsome disease, and this easy extraction often the very cause of its appearing in its most malignant form. The more easily it is extracted, (says Mr. J. Bell) the more easily does it return; and whether carelessly extracted, or altogether neglected, it soon returns. But, when it does return, it has not really changed its nature; it has not ceased to be in itself mild, it is then to be feared, not from its malignity, but from its pressure, among the delicate cells and membranes of the nose. It soon fills the nostrils, obstructs the breathing, and causes indescribable anxieties. The tears are obstructed, and the eyes become watery from the pressure on the lachrymal sac; the hearing is in like manner injured, by the pressure of the tumour against the mouth of the eustachian tube; the voice is changed, and its resonance and tone entirely lost, by the sound no longer passing through the cells of the nose and face. The swallowing is in some degree affected by the soft palate being depressed by the tumour. The pains, arising from such slow and irresistible pressure, are unceasing. From the same pressure, the bones become carious, and the cells of the face and nose are destroyed by its slow growth. It is not long, before the tumour begins to project from the nostril in front, and over the arch of the palate behind. One nostril becomes widened and thickened; the nose is turned towards the opposite side of the face, and the whole countenance seems distorted. The root of the nose swells, and becomes puffy, the features tumid and flabby, the face yellow, and the parts round the eye livid. The patient is affected with head-achs, which seem to rend the bones asunder, and with perpetual stupor, and dozing. The bones are now absorbed, and the membranes ulcerate; a foul and fetid matter, blackened with blood, is discharged from the nostrils, and excoriates them. The blood-vessels next give way, and sudden impetuous hemorrhages weaken the patient; the teeth fall from the sockets, and, through the empty sockets, a foul and fetid matter issues from the antrum.

Now the disease verges to its conclusion. The patient has terrible nights, and experiences a sense of suffocation. The repeated loss of blood renders him so weak, that he cannot quit his bed, for several days together; and when he does get up, he is (to use Mr. Bell's words) pale as a spectre, his lips colourless, and his face like wax, yellow, and transparent. He now suffers intolerable pain, while his saliva is continually dribbling from his mouth, and the fetid discharge from his nose. In this state, he survives a few weeks; during the last days of his illness, lying in a state of perpetual stupor, and dying lethargic. Mr. J. Bell, afterwards, observes, that " if horrid symptoms could establish the fact of malignity, there is not to be found in all nosology a more malignant disease, than this: but, aneurism, though it destroys the thigh-bone, the sternum, or the cranium, is not accounted malignant; neither is polypus malignant, though it destroys the cells of the face, and penetrates even through the ethmoid bone to the brain. These consequences result merely from pressure." (*John Bell's Principles of Surgery, Vol.* 3, *part* 1, *p.* 90—92.)

At the period of correcting the present article (April, 1817), a boy, in St. Bartholomew's hospital, only twelve years old, has just fallen a victim to the ravages of the largest and most disfiguring disease within the nose, which I have ever had an opportunity of beholding. The tumour before death had expanded the upper part of the nose to an enormous size, while below the left nostril was immensely enlarged. The distance between the eyes was extraordinary, being more than four inches. The left eye was affected with amaurosis, brought on by the pressure of the swelling; the right retained to the last the faculty of seeing. The tumour nearly covered the mouth, so that food could only be introduced with a spoon, and an examination of the state of the palate was impossible. About a fortnight before death, the leg became paralytic, and during the last week of the boy's existence, an incontinence of the urine and feces prevailed. On examination of the head after death, a good deal of the tumor was found to be of a cartilaginous consistence, and, what was most remarkable, a portion of it, which was as large as an orange, extended within the cranium, where it had annihilated the anterior lobe of the left hemisphere of the brain. Yet, notwithstanding this effect, the boy was not comatose, nor insensible, till a few hours before his decease. All the surrounding bones had been more or less absorbed, and the place from which the excrescence first grew, could not be determined.

The celebrated Professor Richter has also denied the validity of the objections, urged by Pott against attempting to relieve the patient: neither the malignant nature of a polypus, its adhesions, immoveableness, ulcerations, nor disposition to hemorrhage, &c. are, according to Richter, any apology for leaving the disease to itself. (See *Anfangsgr. der Wundarzn. Band.* 1. *Cap.* 21.)

Mr. J. Bell refutes the common notions, that polypi may be caused by picking the nose, blowing it too forcibly, colds, and local injuries. He asserts, that a polypus is not in general a local, solitary tumour: he has only found it so in three, or four instances. Both nostrils are usually affected. He states, that no finger can reach that part of the nostril, where the root of the swelling is situated, as it is deep and high in the nostrils, towards the throat, and near the opening of the eustachian tube. The finger cannot be introduced further, than the cartilaginous wing of the nose extends, and can hardly touch the anterior point of the lower spongy bone. The anterior and posterior chambers of the nostril are separated from each other by a narrow slit, which the finger can never pass, and which is divided, in consequence of the projection of the lower spongy bone, into two openings, one above, the other below. Through these the heads of the polypus project. These tangible parts of the tumour, however, are very distant from its root, which is in the highest and narrowest part of the nostril. (See *p.* 103, 104.) Mr. J. Bell also says, that three, or four polypi are often crowded together in one nostril, while more are formed, or forming, in the other.

He dwells upon the difficulty and impracticableness of tying the root of a polypus; and explains, that in all attempts to extirpate such tumours, the surgeon's aim should be to reach a point, nearly under the socket of the eye, in the deepest and highest part of the nostrils, and that instruments can only do good when introduced beyond the narrow cleft, formed by the projection of the spongy bone. (*P.* 108.)

Though Mr. John Bell is probably right in his opinion, that polypi do not proceed from several circumstances, which we have above noticed, yet they are, in most instances, diseases of an entirely local nature. Certainly, in general, it is very difficult to describe what is the cause of the polypus nasi. Frequently the patient is, in other respects, perfectly well; and, after the removal of the tumour, no new one makes its appearance. In this circumstance, it must originate from a local cause, though it is generally difficult to define what the nature of this is. Sometimes several catarrhal symptoms precede the polypus, and, perhaps, constitute its cause. It is possible, they may only be an effect of the same cause which gives birth to the tumour; but, no doubt, they are sometimes the effect of the polypus itself. Sometimes, perhaps, a faulty state of the constitution really contributes to the disease; for, several polypi frequently grow in both nostrils, and even in other situations at the same time; are reproduced immediately after their removal; and the patient often has an unhealthy appearance. Notwithstanding it has been asserted, that a solution of the muriate of ammonia, frequently injected into the nose, sometimes disperses polypi, the efficacy of the remedy remains unestablished by experience; as, indeed, the very nature of the disease might lead one to anticipate. An operation affords the only rational chance of a cure.

There are four modes of extirpating a

nasal polypus: viz. extracting it with forceps; tying it with a ligature; cutting it out; and destroying it with caustic.

### EXTRACTION.

Extraction is the most common and proper method. It is performed with the ordinary polypus forceps, the blades of which have holes in them, and are internally rather rough, in order that they may take hold of the tumour more firmly, and not easily slip off it. The front edge of each blade must not be too thin and sharp, lest, with its fellow, it should pinch off a portion of the polypus. The forceps must necessarily have a certain breadth: for, when they are too small, they cannot properly take hold of and twist the tumour. When the handles are rather long, the instrument may be more firmly closed, and more conveniently twisted.

However, the forceps are not applicable to all cases. The anterior part of the polypus, lying in the nostril, distending, and, totally obstructing it, is sometimes quite hard; and, when the forceps are introduced, it presses their blades in such a manner, from each other, as it lies between them, that the instrument cannot be introduced sufficiently far, to take hold of the tumour at a proper depth. If introduced to a proper distance, it cannot be closed. In such a case, says Richter, one might, perhaps, advantageously make use of a pair of forceps which may be separated, and put together again at the joint, and the blades of which diverge from each other behind the joint, and touch again at their extremities. After separating the two pieces, their blades are to be separately introduced, and then joined together again at the joint. The anterior indurated portion of the polypus lies in the interspace, and does not prevent the closure of the instrument.

It is generally deemed of importance to take hold of the polypus with the forceps close to its root; and, indeed, when this rule is observed, the whole of the polypus, together with its root, is commonly extracted, and there is less reason to apprehend hemorrhage, which is naturally more profuse when the polypus is broken at the thick, middle portion of its body. It is also a rule, frequently easy of observance, especially when the polypus is not too large. But, in many instances, the tumour is so large, and the nostril so completely occupied by it, that it is impracticable to get hold of its root. In this circumstance, it is often altogether impossible to discover even where the root lies. Here we must be content to take hold of the polypus as high as possible. The consequences are of two kinds. The tumour sometimes gives way at its root, though it be only taken hold of at its anterior part; and, in other cases, breaks where it is grasped, a portion being left behind, and a profuse hemorrhage ensuing. This is, however, void of danger, if the surgeon loses no time in endeavouring to suppress the effusion of blood; but immediately introduces the forceps again, grasps the remnant piece, and extracts it. The most infallible method of diminishing the bleeding, is to extract what remains behind at its root. In this way, a large polypus is frequently extracted, piecemeal, without any particular loss of blood.

After the polypus has been propelled as far forward, into the nostrils, as it can be by blowing strongly through the nose, its anterior part is to be taken hold of by a small pair of common forceps, held in the left hand; and is to be drawn gradually and slowly out, to make room for the introduction of the polypus forceps into the nostril. The more slowly we proceed in this manœuvre, the more the polypus is elongated, the narrower it becomes, the greater is the space in the nostril for the introduction of the polypus forceps, and the higher can this instrument grasp the tumour. After it has taken hold of the polypus as high as possible, it is to be twisted slowly round, and, at the same time, pulled outward, till the tumour breaks. It is a very important maxim, rather to twist the instrument than to pull it, and thus, rather to writhe the polypus off, than to drag it out. The longer and more slowly the polypus forceps are twisted, the more the part where the excrescence separates, is bruised, the less is the danger of hemorrhage, and the more certainly does the tumour break at its thinnest part, or root. When the extraction is done with violence, and celerity, only a piece is usually brought away, and we run hazard of occasioning a copious bleeding.

As soon as the polypus has given way, the surgeon is to examine whether any part remains behind. When the polypus is very narrow at the place where it has been broken, and the patient can breathe through the nose freely, there is reason to presume, that the polypus has given way at its root, and that none continues behind. The finger, if it can be introduced, procures the most certain information; or the probe, when this, for want of room, cannot be employed. The ancients proposed several means for the extirpation of the remaining piece of polypus: but they are, for the most part, objectionable. It is best to introduce the forceps again, under the guidance of the finger, or probe, and thus pinch, and twist off, the part continuing behind.

Hemorrhage invariably succeeds the operation; and it has, by many, been represented as exceedingly perilous and alarming. But, it is not constantly so, and, in many cases, is quite insignificant. Frequently, however, it is really serious; and, as the surgeon can never know beforehand to what extent it will happen, he is always to furnish himself, before the operation, with the most effectual means for its suppression. The danger of hemorrhage may always be lessened, as was before mentioned, by slowly twisting the polypus at its root, in preference to pulling it directly out. When only a portion of the tumour has been extracted, the surest mode of stopping the effusion of blood, is to extract the remaining part without delay. When the polypus has given way at its root, if there should be profuse bleeding, we may first try, ice-cold water, and strong brandy, which may either be sucked or injected into the nose. This single remedy proves effectual in numerous instances. If the hemorrhage should still prevail, it may always be checked with certainty, how copious soever, it may be, in the following manner. Roll a considerable piece of lint, as fast as possible, round the extremity of a probe; wet it completely through, with a strong solution of zincum vitriolatum; introduce it into the nostril, and press it as strongly as possible against the part whence the blood issues. When the nostril is very much dilated, the fingers may be used, for this purpose, with more advantage than the probe. The point, from which the blood is effused, may easily be ascertained, by asking the patient at what part of the nostril he experienced the most pain in the operation; and then pressing the finger on various points in this situation. As soon as the blood ceases to flow, we may conclude, that the finger is on the situation of the hemorrhage. This method is so efficacious, that there is seldom occasion for any other. When the bleeding point lies deeply in the nostril, it might be difficult to reach it with the finger. At all events, we may then employ the plan, which some so strongly praise in urgent cases.

A piece of cat-gut may be introduced into the nostril, and, by means of a pair of forceps, be brought out of the mouth. A roll of lint is then to be attached to it, and drawn through the mouth into the nose; thus the posterior aperture of the nostril may be stopped up. Then the nostril in front is to be filled with a sufficient quantity of lint, moistened in the solution of zincum vitriolatum.

The objections to extracting some polypi, says Richter, have been much exaggerated. When the polypus is so large, that its root cannot be got at, its anterior part is to be taken hold of, and the tumour extracted piecemeal. It has already been noticed, that this practice is free from danger. Experience does not prove, that the polypus, which often bleeds profusely, is apt to occasion a violent hemorrhage in the operation; and, even if it should do so, powerful measures may be adopted for the stoppage of the bleeding. The malignity, and ulcerations, attending a polypus, are no objections to the operation; but, are rather motives for its being promptly performed, as delay must occasion more manifest and urgent danger. If the polypus should be here and there adherent to the membrane investing the nostrils, it is proper to separate it, before the operation. This object cannot be accomplished by straight inflexible instruments, such as have been invented by various surgeons. It may be very conveniently done, according to Richter, with thin, long, flat pieces of tortoise-shell, introduced as deeply as possible into the nostril, on every side of the polypus. As it can seldom be known with certainty, *à priori*, that adhesions are not present, it is proper, whenever the tumour is large, to introduce these instruments before the operation.

Sometimes, the greatest part of the polypus extends backward, hanging down behind the palatum molle, towards the pharynx. If there should be but little of the polypus visible in the nostril, its extraction must be performed backward, in the throat. This is usually done with a pair of curved polypus forceps, which are to be introduced through the mouth, in order to seize and tear off the tumour as high as possible above the soft palate. Care must be taken not to irritate the root of the tongue, or else a vomiting is produced, which disturbs the operation. When the polypus cannot be properly taken hold of, we may, according to the advice of some surgeons, divide the soft palate. But this is very rarely necessary. As, by this mode, the polypus is not twisted, but pulled away, the hemorrhage is, in general, rather copious. If a fragment of the tumour should remain behind, it may commonly be extracted through the nose.

Some recommend, for the extraction of polypi in the throat, a ring, consisting of two semicircular portions, with a kind of groove externally, which are capable of being opened and shut, by being fixed on the ends of an instrument constructed like forceps. A ligature is to be placed round the ring, and its end is to be brought to the handle of the instrument, and held with it in the hand. The instrument is to be introduced into the mouth, under the polypus, and expanded as much as the size of the tumour requires. Its ring is then to be carried upward, over the polypus, so as to embrace it; and afterwards is to be shut, whereby the noose after being carried upward, is disengaged from the ring. The noose is to be pushed as high as possible over the tumour, by means of forceps, and the extremity of the packthread is then to be drawn, so as to apply the noose tightly round the polypus. When this is done, the ring of the instrument is to be turned round, firmly closed, and placed in front of the polypus, on the noose, in such a way, that the packthread is to lie between two little pegs, made for the purpose, at the ends of the ring. On drawing the packthread firmly, and pressing the instrument, at the same time, downward, so as to make it act like a lever, the polypus, in general, easily breaks. Another peg projects in the direction of the ring, so as to prevent the ligature from insinuating itself within the circle. (See *Theden's Bemerk. Part* 2. *and Plate* 6. *fig.* 1. *in Richter's Anfangsgr.*)

The employment of this instrument, however, is attended, says Richter, with many difficulties, and little advantage. Polypi in the throat are most conveniently extracted by the ordinary straight polypus forceps, with which they may be seized, and gradually drawn out through the mouth. The tumour generally allows itself to be drawn out without trouble, and the inclination to vomit, which at this moment occurs, also contributes to propel it outward. When it is so stretched, that it cannot be drawn out further, without considerable force, a spatula is to be introduced into the mouth, and to be carried as high as possible behind the polypus, in order to press it downward, toward the root of the tongue. When the tumour is, at the same time, forcibly pulled outward by the forceps, it usually gives way.

When the polypus is situated partly in the throat and partly in the nostril, though it admits of being extracted, in the same way, through the mouth, yet its anterior part often continues attached, and must afterwards be separately removed through the nostril. It is also frequently advisable to twist off the anterior portion of the polypus first, by which, the mass in the throat is often rendered so loose, that it can be easily extracted. Whenever it is conjectured, that the polypus will come away in two pieces, it is always preferable first, to extract the part in the nostril, and afterwards that in the throat: because, the separation of the last is constantly productive of more bleeding, than the removal of the first. Sometimes, the following plan succeeds in detaching the whole polypus at once. Both the part in the nostril, and that in the throat, are to be firmly taken hold of with the forceps, and drawn at first gently, and then more forcibly, backward and forward. By such repeated movements, the root is not unfrequently broken, and the whole polypus brought away from the mouth.

Frequently the polypus grows again. Policy requires that the patient should be apprised of this beforehand. Some of the root remaining behind, may often be a cause of the relapse. Hence, the surgeon should examine carefully, after the operation, the part at which the root of the polypus was situated, and separate, and twist off, most diligently, with the forceps, any fragments that may still continue attached. The recurrence of the disease, however, may arise from other causes. The tumour is occasionally reproduced, after it has been extracted in the most complete manner; and, doubtless, this circumstance is sometimes owing to the continued agency of constitutional causes, which so often remain undiscovered and unremoved. Sometimes, also, the recurrence of the disease is owing to a local morbid affection of the Schneiderian membrane, or of the bones situated beneath the root of the polypus. Richter, in this case, approves of the cautery; but few English surgeons will coincide with him. The polypus, occasionally observed subsequently to the operation, is frequently not, in fact, a new substance, but only a part of the original tumour, not previously noticed by the surgeon. Sometimes it occurs, that a smaller and a larger polypus are found in the nose at the same time. The larger one is extracted, while the other remains undiscovered; and, when it has increased in magnitude, it is apt to be mistaken for a reproduction of the one previously extirpated. (See *Richter's Anfangsgr. der Wundarzn. Band.* 1. *Kap.* 21.)

### LIGATURE.

As the extraction of the polypus is invariably attended with hemorrhage, which is sometimes profuse, another more modern method of cure has, with some, gained the preference, as being far more convenient and secure. This is, tying the root of the tumour with a ligature, by which the polypus is thrown into the state of inflammation, suppuration, and sphacelus; and, at length, becomes detached. Many instruments have been invented for applying the ligature; but Levret's double cannula seems to be the best. Through this, a silver wire is to be introduced, so as to form a noose at the upper end of the instrument, proportioned in size to the anterior part of the tumour, situated in the nostril. The two ends of the wire are to hang out of the two lower apertures of the double cannula; and one of them is to be fastened to a small ring on its own side of the instrument. The other is to remain loose. The wire must be made of the purest silver, and ought to be as flexible as possible, that it may not readily break. It must, also, not be too thin, lest it should cut through the root of the polypus. The cannula is to be somewhat less than five inches long. By the assistance of this cannula, the noose is to be introduced into the nose, and put round the polypus. But, as the cannula, which is usually constructed of silver, is straight and inflexible, while the inner surface of the nostril is preternaturally arched, especially when much distended by the polypus, it is easy to discern that its introduction must be attended with considerable difficulty. In fact, it can seldom be introduced as deeply as the root of the polypus. There are two ways of avoiding this obstacle. The cannula may either be passed under the polypus, over the ossa palati, which present a tolerably straight surface, or it must be curved a little. Perhaps, a tortoise-shell cannula, says Richter, might be convenient.

The noose is to be applied in the following manner. The polypus is to be taken hold of with the forceps, and drawn a little out of the nose. The noose is then to be carried over the forceps and polypus, into the nostril. In order to carry it as high as possible, it is necessary not to push the cannula straight forwards into the nose, but to move it from one side of the polypus to the other. The more deeply the instrument has entered the nose, the more of the loose end of the wire must be drawn out of the lower aperture of the cannula, so as to contract the noose, which otherwise might stop in the nostril, and not be carried sufficiently high. The elasticity of the silver wire tends to assist in raising it over the polypus, and, hence, it is more easy of application than a more flaccid kind of ligature. When there is cause to conclude, that the polypus is complicated with adhesions, they must be previously broken, in the way already mentioned.

As soon as the noose has been introduced as deeply as possible, the loose extremity of the wire is to be drawn out of the lower aperture of the cannula, and rolled round the ring on that side of the instrument. Thus the root of the polypus suffers constriction. The wire must not be pulled too forcibly, nor yet too feebly. In the first circumstance, it readily cuts through the root of the polypus; in the second, great tumefaction of the excrescence, and many inconveniences arise, which a tenser state of the wire prevents. As the noose gradually makes a furrow, where it surrounds the polypus, it grows slack, after a short time, and no longer constricts the tumour. One end of the wire, therefore, is to be daily unfastened, and drawn more tightly. The more tense it is kept, the sooner the separation of the polypus is brought about. Hence, when it is particularly indicated to produce a speedy detachment of the polypus, the wire should be tightened, at least, once a day.

In this manner the cannula is to remain in the nose, until the noose is detached, together with the polypus. There is another method of tying the tumour, without leaving the cannula in the nose. After the noose has been introduced as far as possible into the nostril, the two ends of the wire are to be twisted round the two rings, and the cannula is to be turned round a couple of times. The wire is then to be unfastened from the rings, and the cannula withdrawn. In this way, the noose is made to embrace the polypus, round which it remains fastly applied. Whenever it is wished to produce a greater constriction, the cannula may be again introduced into the nose, the ends of the wire fastened to the rings, and the instrument turned round again; after which, it is to be taken away, as before. As the cannula, when it continues long in the nose, may occasion pain, and other inconveniences, the last method seems preferable to the former. However, introducing and withdrawing the cannula every day, as Richter adds, may, perhaps, be equally troublesome and painful. The cannula, for this purpose, being necessarily straight, is by no means handy. One might, at all events, make use of a single cannula, the upper opening of which is divided by a bridge; this could be much more conveniently twisted than a double one.

Although the ligature has been very much praised by some of the moderns, it is attended with so many difficulties, that the forceps are infinitely preferable in the majority of cases. Hemorrhage is the only inconvenience, for which extraction is abandoned for the employment of the ligature. But this, as was before stated, is far less dangerous, than is represented. The inconveniences of the ligature are far more serious, and numerous. The cure by the ligature is always accomplished with much less expedition than by extraction. When the polypus is of such a size as to occupy the whole of the nostril, it is generally impracticable to introduce the noose to a sufficient depth. The figure of the polypus renders it almost impossible to tie its root; for, commonly, the tumour expands very much before and behind, and the wire must be brought over the posterior part of the polypus, ere it can be applied to its root. In general, also, the noose only includes the front part of the polypus, while the root, and back portion remain untied, and, consequently, do not become detached.—It is, indeed, asserted, that the ligature, when only applied to the front part of the polypus, is capable of bringing about inflammation, suppuration, and a detachment of the whole of the tumour. This may sometimes be the case; but, analogous instances prove, that it is undoubtedly not constantly so. The ligature seldom accomplishes an entire destruction of the disease, and there is usually reason to apprehend its recurrence. If the polypus be very large, and the whole nostril occupied, it is frequently utterly impossible to introduce the wire; and, when this is done, the front of the tumour alone can be tied.

The polypus nasi is commonly highly sensible, and, consequently, tying it proves very painful. As soon as the noose is drawn tight, not only the polypus inflames, but, the whole extent of the Schneiderian membrane. The pain, and inflammation, often extend even to parts at some distance, such as the throat, eyes, &c. occasioning acute fever, which requires the strict observance of low diet, the exhibition of cooling physic, and the evacuation of blood. Hence, it is advisable in many cases, to prepare patients for this treatment, by diet and medicines.

When the polypus is tied, it swells very much, and all the complaints which it previously caused are exasperated. But, in particular, the part situated in the throat, sometimes obstructs deglutition, and respiration, in such a degree, that prompt relief becomes necessary. The patient soon derives comfort, when a few punctures are made into the tumour. These excite a bleeding, that very speedily lessens the swelling, but is, sometimes, difficult to check. Hemorrhage from a part of the polypus that is tied, is most effectually stopped, by twisting the wire so tight, that it closes the arteries distributed to it.

The wire sometimes breaks off close to the lower aperture of the cannula, in consequence of being twisted so much, and thus the progress of the cure is interrupted. A new wire may be introduced; but it is difficult to apply it exactly in the situation of the other. A fresh place is commonly tied, which is almost the same thing as commencing the cure anew. It is better to prevent this interruption of the treatment, by employing very flexible wire, made of the purest silver; and by not twisting and untwisting regularly the same extremity of it, but sometimes one and sometimes the other. A strong piece of cat-gut might be a very good substitute for silver wire.

Immediately the polypus is tied, it swells, inflames, and becomes painful; in a few days, it becomes shrunk, free from pain, and sphacelated. The fetid discharge now occasions considerable inconvenience to the patient, and ought to be washed away by repeated injections. Towards the termination of the case, the surgeon ought to take hold of the polypus with the forceps, to try whether any of it is loose. When the polypus is extracted, one may inject a solution of alum, for a day or two afterwards, in order to diminish the effect of the irritating dicharge on the Schneiderian membrane, and the suppuration in the situation of the ligature, as it is sometimes profuse, and of long duration.

Though one might also tie polypus tumours in the throat; and, indeed, the introduction of the cannula through the mouth, and the application of the noose, would be attended with no great difficulty; and, though the treatment might be rendered more tolerable to the patient, by withdrawing the cannula after twisting the wire; yet, the swelling of the tied portion of the tumour, would, probably, create immense inconvenience. In this case, therefore, extraction usually merits the preference, and the ligature is only fit to be practised in the throat when the polypus is very small, or there is some especial cause forbidding extraction. When deglutition and respiration are impeded by the swelling of the tied portion of the polypus in the throat, the swollen part must be scarified by means of the pharyngotomus, so as to excite a bleeding, and, thereby, produce a diminution of the swelling. The noose is to be frequently and strongly tightened, in order to accelerate the detachment of the polypus, and shorten the inconveniences. When the excrescence has not only descended towards the pharynx, but also into the nostril, its front portion is to be tied first. The result of this may be, such an inflammation and suppuration of the whole polypus, that, after the separation of its anterior portion, the posterior one may also become detached, or at least, easy of removal.

### CAUSTICS.

The cautery, formerly recommended for the cure of the polypus nasi, is now almost entirely rejected, and, indeed, in the manner it was customary to use it, little good could be done. It was applied to the anterior surface of the tumour in the nostril, and its employment was repeated every time the slough separated. Its operation could naturally be but of small extent, as it only came into contact with a trivial portion of polypus. Its irritation augmented the determination of blood to the excrescence, and accelerated its growth; while as much of the tumour was reproduced, ere the slough separated, as was thus destroyed; and the design of completely extirpating the disease, in this way, seldom or never proved successful. However, says Richter, there is one particular example, where the cautery is the only means from which relief can be derived; and, used in a certain way, it always speedily produces the desired effect.

There are polypi of the nose, which readily bleed profusely. Touching them in the gentlest manner, and every trivial concussion of the body, give rise to hemorrhage. The patient is exceedingly debilitated by repeated loss of blood; his countenance is pallid; his feet swollen; he is affected with hectic fever; and faints whenever there is any considerable bleeding. Doubtless, extraction, in this case, is a very precarious method, as the patient is so circumstanced, that any copious effusion of blood must be highly perilous. Sometimes the polypus is, at the same time, so large, and the nostril so completely occupied and distended, that it is impossible to apply a ligature. Such is the case, to which alone the cautery promises assistance. (*Richter.*)

In employing the cautery, (says the latter author,) the object is not to effect, by its direct agency, a gradual destruction of the polypus; but to excite such an inflammation, and suppuration, of the whole of it, as shall lead to this event. To fulfil this purpose, a common trocar, three inches long, may be used. The cannula ought to be two inches shorter than the trocar, whereby the latter may protrude from it so far; and it should be constructed with a handle. The cannula should be made wider than it is in common, to allow the trocar to be introduced, and withdrawn with facility. It is to be wrapt round with a piece of wet linen, and applied to the polypus. The red-hot trocar is then to be pushed into the tumour, as far as the cannula will allow it, which is, of course, two inches.

According to Richter, this method of treatment is far less painful than it has the semblance of being. It is only necessary to dry the front part of the nostril, and fill it with lint all round the cannula, in order that any moisture, heated during the operation, may not touch, and injure the inner surface of the nose. If care be taken to introduce the trocar in a proper direction, there is no reason to fear damaging the septum nasi, especially as it is preternaturally distended by the polypus. The immediate effect of the operation is to bring on an inflammation and swelling of the whole polypus, frequently accompanied with head-ach, sore throat, fever, and other complaints, which require the antiphlogistic treatment; but, on the whole, are not dangerous.

When the patient entertains a dread of the actual cautery, Richter sanctions the use of the potential one, in various forms. One might introduce into the puncture of the unheated trocar, a tent of the emplastrum cantharidum, or a tent smeared with butter of antimony, which may be allowed to continue in for some time. But, these applications operate slowly, and are hardly capable of exciting inflammation of the whole polypus.

As soon as suppuration has taken place, emollient and detergent lotions should be injected into the nose; cleanliness, and the promotion of the suppurative process, demand them. It is only requisite to maintain suppuration, until the polypus is so small, that it can be conveniently extracted, or tied. To effect its entire destruction by suppuration, is a tedious undertaking. (*Richter's Anfangsgr.*) In England, the actual and potential cauteries are now entirely abandoned.

### EXCISION.

In the treatment of the polypus, the use of cutting instruments has always been reprobated, because they usually occasion a profuse hemorrhage, and can hardly ever be passed, without mischief, to a sufficient depth into the nose to divide the root of the tumour. Yet, there are instances, in which their use might be productive of advantage. The anterior part of the polypus, situated in the nostril, is sometimes so thick and hard, that it is utterly impracticable to introduce the forceps for the performance of extraction, or the cannula for the application of the ligature. In such a case, it might be a judicious step to cut off the front of the polypus, with a sharp instrument, of a suitable shape, in order to make room for the use of the ligature, or forceps. The polypus is sometimes of a ligamentous structure, and neither admits of being tied nor extracted. There is no means of removing such a polypus, except the knife, by which it is to be cut away piecemeal.

Mr. Whately after failing in several attempts to extract, and tie, a considerable polypus of the nose, succeeded in cutting it out. He used "a narrow, straight bistoury, with a probe-point, having a sheath fixed upon its edge, by a screw put into a hole in the handle. An eye was made at its point, to receive one end of a thread intended to be passed round the polypus, for the purpose of directing the knife to the extremity of the tumour. There was also a contrivance by which the knife could be unsheathed at its extremity, the length of three quarters of an inch. This was done by means of the screw, which might be fixed in another hole, by drawing back the sheath. By exposing such a length of edge only, the interior parts of the nose were defended from the danger of being wounded." Whoever wishes a particular account of the manner of using the instrument, must consult Mr. Whately's *Cases of two extraordinary Polypi, &c.* 1805.

In the polypus, which arises from a relaxation of the Schneiderian membrane, external astringent applications may be first tried; such as ice-cold water, solutions of acetite of lead, alum, muriate of ammonia, &c. These remedies (says Richter) commonly lessen it, and frequently, when it is not very large, accomplish its entire removal. If this should not happen, there is no reason against putting a ligature round it. Here, also, we may venture to employ a cutting instrument, if it be in our power to do so. At all events, an effort may be made to bring on suppuration of the tumour, by the cautery. But, the practice of extraction is here prohibited.

When the Schneiderian membrane is preternaturally swollen all over the nostril, which is quite obstructed, the pervious state of the cavity is to be restored by the introduction of cat-gut, or bougies. A thin piece at first passed into the nose, and afterwards a larger and larger one gradually, until the passage for the air is perfectly re-established. But, usually, this relief is only of short duration, as the nostril very soon closes again. Hence, such patients are advised to make constant use of flexible tubes passed into the nose; or, when this is too troublesome, to fill the nose regularly at bed-time, with catgut, and take it out again in the morning. (See *Richter's Anfangsgr. Band.* 1.)

### POLYPI OF THE UTERUS.

The polypus of the uterus is of three kinds, in respect to situation. It either grows from the fundus, the inside of the cervix; or from the lower edge of the os uteri. The first case is the most frequent, the last the most uncommon. Polypi of the uterus are always shaped like a pear, and have a thin pedicle. They are almost invariably of that species, which is denominated fleshy, hardly ever being scirrhous, cancerous, or ulcerated.

The polypus of the first kind, growing from the fundus uteri, is very difficult to detect in its incipient state. While it is small, it produces not the smallest perceptible change in the organs of generation. As it enlarges, it distends the uterus, and often excites a suspicion of pregnancy, which a more attentive examination, however, soon disperses. The swelling of the abdomen does not take place in the degree and space of time, which it does in pregnancy; the menstrual discharge continues to flow; the breasts do not become full; and, in the progress of the case, no motion is to be felt. While the polypus lies in the uterus, its growth is slow. It frequently, at this early period, occasions profuse bleeding. Women afflicted with the disease, are seldom pregnant, and when they are so, parturition commonly happens prematurely. However, it occasionally occurs, that they hold out till the end of the regular time, and experience an easy and safe delivery.

As the polypus increases, it expands the os uteri, and, at length, protrudes into the vagina. This either takes place suddenly from an accidental concussion of the body; or slowly and gradually. In the latter circumstance, pains similar to those of labour occur, and cause the tumour to be expelled into the vagina. As soon as it has arrived in this situation, and is no longer confined and compressed by the uterus, it begins to grow more rapidly, and gives rise to far more troublesome complaints. It presses the bladder and rectum, and thus, more or less, disturbs the evacuation of the urine and feces. But, in particular, it causes repeated and profuse hemorrhages, which weaken the patient exceedingly, and often bring her to the brink of the grave. The root of the polypus is situated in the os uteri, and is there so compressed, that the blood in the polypus is prevented from returning through the veins; consequently, all the vessels become turgid, and the above effusions of blood are the result. Though they generally cease spontaneously, the least circumstances cause their recurrence; such as slight concussions of the body in riding, walking, &c. In the mean while, a quantity of mucous and aqueous fluid is voided, by which the patient's strength is more reduced. The polypus, the source of this blood and mucus, is frequently misunderstood, and the patient is in a perilous state. So necessary is it in cases of preternatural discharge from the uterus, always to examine with the finger, *per vaginam.*

When the polypus has been for some time in the vagina, it at length protrudes from it externally. This happens gradually or suddenly, on the occurrence of any concussions of the body. Hence, it again excites additional grievances. As it cannot descend so low, without dragging the fundus of the uterus downward with it, and occasioning its prolapsus, the patient, on walking, or standing, commonly experiences a very painful sense of dragging, or stretching, in the pelvis. As the bladder and ureters are also forced into a deranged position, the evacuation of urine is, more or less, disturbed, or rendered difficult. The flow of the urine over the polypus, as well as the irritation of outward friction on it, frequently causes it to inflame, become painful, and ulcerated.

The polypus situated in the vagina, or protruding from it externally, may easily be mistaken for a prolapsus uteri: an error that may have very perilous consequences; but, by a careful examination, is generally not difficult to avoid. The polypus is softer and less sensible, than the uterus in the state of a prolapsus. The imperfect prolapsus uteri, in which this viscus is not turned inside out, is betrayed by the os tincæ, at the lower part of which it is plainly perceptible. In this situation, the polypus may occasionally have a depression, resembling the mouth of the womb, but easy of discrimination from it. A probe can be passed deeply into the os uteri; but, not so into this other opening. The polypus resembles an inverted pear, that is, it is thickest below, and becomes gradually thinner upward. The above species of the prolapsus uteri, is thinnest below, and gradually increases in width upward. The fallen uterus may easily be pressed back, and when it is so, the patient experiences relief. The polypus does not admit of being pressed back, and, during an attempt to do this, the patient is put to much inconvenience. A probe may be introduced by the side of the polypus deeply to the fundus uteri. When passed by the side of the fallen uterus, it is very soon stopped at the upper part of the vagina, which has sunk down with the cervix of this organ.

It is much more easy to distinguish a polypus protruded externally from the vagina, from a perfect prolapsus uteri, without inversion. The os uteri at once characterises the uterus, as it can here not only be felt, but seen. A probe may be passed deeply into the vagina, along the side of the polypus; but, not so by the side of the uterus, for reasons easy of comprehension. Moreover, the figure of the tumour, and the state of the patient, on an effort being made to reduce the protruded part, betray its real nature.

The inversio uteri is commonly the consequence of a difficult labour, and hence is easily discriminated from a polypus, by its occasional cause. While the inverted uterus lies in the vagina, its shape is broad above, and narrow below; whereas the polypus is thin above, and broad below. Hence, in cases of very large polypi in the vagina, the os uteri is but little dilated; while it is extremely distended by the incomplete descent of the inverted uterus itself. Here, likewise, the reduction of the part is attended with relief; while every effort to push back a polypus causes an aggravation of all the complaints.

When the inverted uterus hangs out of the vagina, its figure, like that of the polypus, is thin upward, and broad downward; and, like the latter tumour, has no aperture at its lowest part. Here, an erroneous opinion is very liable to be formed. An attentive observer, however, will easily avoid it. The inverted uterus includes a circular fold at its upper part, next to the orifice of the vagina. This fold is nothing less than the os uteri itself, through which the body of this viscus has descended. There is nothing of this kind to be felt in cases of polypi. By the side of a polypus the finger or probe may be passed deeply into the vagina; but not so by the side of the uterus. The root of the polypus is firm and hard to the touch; the upper thin part of the uterus, which is hollow, has a soft flabby feel. Useful light is also generally thrown on the case, by the above-mentioned occasional cause of the prolapsus uteri with inversion.

In the two last descriptions of uterine polypi, which are situated either on the inside of the cervix, or at the margin of the os uteri, the disease is, as it were, from its commencement in the vagina, and the tumour, when large, produces all the complaints attending polypi of the first kind, except frequent profuse bleedings. These seldom occur, and when they do, are slight, because the root of the polypus suffers no constriction in the os uteri. As it descends out of the vagina, it occasions a prolapsus uteri without inversion, in addition to the other inconveniences.

### TREATMENT OF POLYPI OF THE UTERUS.

Experience proves, that uterine polypi, when once extirpated, have not that propensity to be re-produced, which those of the nose have. Extraction is not fit to be practised here for obvious reasons. Sometimes, however, uterine polypi are met with, which have such a thin and soft pedicle, that although they ought not to be pulled out, yet they admit of being twisted off with facility and safety. Also, numerous complaints of a serious nature, are occasionally the result of tying a polypus of the uterus. In this circumstance, after the ligature has been applied some days, we may attempt to shorten such complaints, by twisting off the tumour altogether. This object is most conveniently performed with a pair of forceps, made something like Smellie's midwifery forceps. As the part of the polypus in the ligature is constricted, thin, and already partly detached, the tumour, with a little caution, may frequently be easily twisted off, and that without any material bleeding. The actual and potential cautery are here unnecessary, as there is always room to employ the instruments for applying the ligature.

The ligature is the most proper means of extirpating uterine polypi, and is here much more easy of application, than in the nose. How large soever the polypus may be, there is always abundance of room for the introduction of the necessary instruments. The polypus of the uterus has, commonly, a thinner pedicle, than that of the nose; and, hence, its cure by the ligature is more expeditious, than that of the latter case. The swelling of the tumour, after the ligature is applied, occasions here far less inconvenience, than in the nose, on account of the greater room, and more yielding nature of the parts. The inconveniences that do arise, are easy of removal; for instance, the retention of urine may be relieved by the catheter: costiveness by glysters, &c. Uterine polypi are also less sensible, than nasal ones; and hence, less pain and fever follow the application of a ligature to them. The fetid matter, that forms as soon as the polypus sphacelates, has a free vent out, and may easily be washed away by injections.

That the polypus cannot be tied, while it lies in the uterus, is easily comprehensible. But, immediately it has descended into the vagina, the operation may be undertaken, and may be performed with the same kind of double cannula, as was employed in the nose. However, here it is extremely requisite, that the cannula should be rather longer, than that already described, and somewhat curved. But, as the silver wire sometimes breaks, two other very convenient instruments have been invented.

The first is M. Levret's instrument. It consists of two silver cannulæ, which are curved in such a manner, and so united by a joint, that they are shaped like a pair of forceps. After introducing a ligature through the two tubes, so that its ends hang out of their lower apertures, the instrument is to be shut, and passed upwards into the vagina, over the polypus, on whichever side seems most convenient. Then it is to be opened, and the polypus is to be pushed through the two branches of the instrument, which is to be brought over the opposite side of the tumour. In doing this, the ligature becomes applied round the root of the polypus, and forms a noose. The extremities of the ligature are next to be drawn as tightly as possible out of the lower openings of the cannulæ, and tied first in a surgical knot, and then in a slip-knot. When this is done, the instrument is shut, and the ligature constricts the root of the polypus. Afterwards it is to be tightened daily, until the tumour separates.

It is plain, that this instrument has some defects, which are, however, easily amended. It is very inconvenient, that it should be necessary for the surgeon to have several such instruments, of various sizes, and curvatures, to be able to select that, which seems most calculated for the magnitude and shape of the polypus. Moreover, as the size and figure of the polypus cannot always be ascertained beforehand, it is often indispensable to try several instruments, ere the most suitable one is found out, and such fruitless attempts must be very irksome and painful to the patient. The worst is, that though the upper ends of the instrument were to touch, when the lower are tied together, yet there would always be a space between the two apertures, where no ligature would be applied to the root of the polypus, and where, consequently, its separation would not easily be accomplished. The tubes may, also, bend with the force used in applying them, and the pain caused by the expansion of the instrument, would then be very considerably increased.

All these defects are done away in the instrument described by Nissen, *de polypis uteri*, (See *Richter's Chir. Bibl. 9. B. S.* 613.) It consists of two silver tubes, twelve inches in length, and as thick as an ordinary writing pen. Both are curved about as much as the os sacrum; but, as they are made of pure silver, the curvature may easily be increased or diminished, according to circumstances. Through each of the cannulæ a strong ligature is to be passed, so that its ends hang out of the lower apertures, while its middle portion forms a noose between the upper apertures of the cannulæ.

The tubes are to be kept together, until they have been introduced into the vagina, as far as the root of the polypus. One is then to be held fast, while the other is to be carried round the tumour, to the opposite side of the cannulæ that remains stationary. Thus the ligature becomes applied round the root of the polypus. After introducing the finger into the vagina, to ascertain that the ligature lies in its proper situation, its ends are to be drawn through a small double cannula, which is only one third of an inch long, but so wide that it can be pushed over both the tubes a certain way with the finger, and the upper end of the long cannulæ with the aid of a sort of long probe, with a forked extremity. Then a third double cannula, through which the ends of the ligatures have likewise been passed, and the width of which is sufficient, is to be pushed over the lower ends of the long cannulæ, so as to unite them. The ligatures are next to be drawn tight in the ordinary way, and fastened to the rings. The management of this instrument is so easy, as to need no further explanation.

This instrument is certainly far superior to any one commonly used in this country. It is difficult to pronounce, whether its simplicity; aptness for the object intended; or, the facility of using it; lays the greatest claim to our commendations. The same reasons, which recommend its employment in polypi of the uterus, equally point out the advantage of having an instrument, constructed on the same principle, for tying nasal ones.

Besides the above instruments, there are numerous other ones, that have been devised, and recommended for tying polypi of the uterus. That, invented by Desault, claims the attention of such surgeons as wish to be informed of others.

Acute symptoms frequently follow the application of the ligature, and are either of an inflammatory, or spasmodic kind. The former require antiphlogistic treatment. Sometimes a fever arises, and the polypus becomes exceedingly painful: in this case, venesection is often necessary. The spasmodic symptoms require the exhibition of opium. When this is ineffectual, and the symptoms are severe, it may be proper to slacken the ligature a little. As the polypus at first always swells, it produces great pressure on the adjacent parts. For this reason, it is generally necessary, for the first few days, to draw off the urine with the catheter, and to open the bowels with glysters. Sometimes hemorrhage takes place. This is generally suppressed by astringents; but, when they prove ineffectual, tying the ligature more tightly answers the purpose. The rest of the treatment resembles that of nasal polypi.

When the polypus is large, forceps are, in the end, often necessary for its extraction. The inflammation, or ulceration, that may possibly be occasioned in the vagina by the fetid matter, is easily removed by injections after the detachment of the polypus. As the ligature is always applied round the pedicle, closely to the os uteri, consequently seldom to the root of the polypus, which is usually at the fundus uteri, there is almost always a portion of the root remaining behind, after the tumour has separated. Though it is said, that this afterwards diminishes, and falls off; yet, it is quite a matter of uncertainty. But, it is an undoubted fact, that the polypus uteri is seldom reproduced. (*Richter.*)

This author observes, that cutting instruments are, in general, improper to be used for polypi of the uterus, as their employment would injure the vagina, and for the most part, occasion a dangerous hemorrhage. There is, however, one case, where the knife is indispensable. The polypus has occasionally a ligamentous pedicle, and consequently can neither be tied, nor extracted. This circumstance is usually undiscovered till after a ligature has been applied, which here commonly produces extraordinary pain, and, though it be applied ever so long, and forcibly, occasions no detachment of the polypus. In this instance, the surgeon has the choice of two plans. He may either cut off the polypus closely to its root in the vagina; or he may first draw it gradually downward out of this situation. The first object might, perhaps, be performed with a sharp hook, somewhat curved at its side, and similar to what is used for tearing the fœtus piecemeal in the uterus; or, with what seems better, a pair of long curved, blunt-pointed scissars. The last object may be accomplished with forceps resembling Smellie's midwifery ones. They are to be introduced into the vagina in the ordinary way. The polypus is then to be taken hold of, and gradually drawn so far out of the vagina, that its pedicle may be divided with a knife. This is, indeed, not done without pain, and a forcible inversion of the uterus; but, it is always free from dangerous consequences. When a polypus, the root of which is attached to the fundus uteri, lies in the vagina, the uterus is always, in some degree, inverted beforehand; and this state is, therefore, only increased by the foregoing plan, which never creates danger, when done slowly, and cautiously. How often has the uterus been suddenly inverted, and forced outward, without fatal consequences! Besides, the above plan has already been successfully practised. (See *Herbiniaux, Parallèle des différens Instrumens pour la Ligature des Polypes.*)

When a polypus, that has its pedicle attached to the fundus uteri, suddenly falls downward, it occasions a sudden inversion of this viscus. In order to relieve, as speedily as possible, the great pain, and danger of this case, the surgeon must tie the root of the polypus, as soon, and as firmly as he can, and pass the ligature, by means of a needle, through the pedicle, before the place where it is tied, allowing the ends afterwards to hang down for some length. Then the polypus is to be amputated below the ligature, and the uterus immediately reduced. This is another example, where a cutting instrument may be used with advantage. The ordinary method of tying such tumours, so situated, accomplishes only a slow detachment of them, and is not sufficiently expeditious in procuring relief.

Fleshy excrescences also occasionally form in the vagina, some of which have a broad basis, and others a thin pedicle. The last merit the appellation of polypi. Their existence is easily ascertained by the touch. By making pressure on the bladder, and rectum, they occasion several impediments to the evacuation of the urine, and feces. They may be most conveniently tied, by means of the double cannula. Should the polypus be situated at the lower part of the vagina, the cannulæ would not be required. The ligature might be applied with the hand, and the tumour cut off below the constricted part.

There is still another kind of tumour in the vagina, to be classed in the rank of polypi. It resembles, in many points, the polypus of the mucous membrane of the nostril, consisting altogether of the membranous lining of the vagina, which, at the part affected, becomes relaxed, thickened, and elongated; hence, the tumour might more properly be termed a *prolapsus of the membrane lining the vagina*, than a polypus. When it resists the efficacy of astringent and corroborant injections, it may be tied, or, what is better, cut off.

A polypus in the œsophagus renders deglutition difficult; and, when of large size, puts an entire stop to it. When an inclination to vomit is excited by irritating the throat with the finger, or a feather, the polypus, if situated towards the upper part of the tube, ascends into the mouth, so as to become visible. But, as it impedes respiration during its residence in the mouth, the patient is soon necessitated, as it were, to swallow it again. When the polypus is situated at the lower part of the œsophagus, of course, it cannot be brought into the mouth, and is very difficult to detect. The difficulty of swallowing, its only symptom, may result from other causes. In this case, it is also incurable; for, it is impossible to take hold of it with instruments. An operation can only be practised, when the polypus is situated at the upper part of the œsophagus. The tumour obviously cannot be extracted; it can only be tied, and this is difficult. In order to apply the ligature, the excrescence must be first brought into the mouth by exciting an effort to vomit. As this impedes respiration, the operation must be done with the utmost celerity, and the ends of the ligature cut off short, that the patient may immediately swallow the tumour again. It is easy to discern, that in this way, the ligature is never applied sufficiently close to the root of the polypus, nor tightly enough; consequently, the separation of the tied portion either does not take place at all, or very slowly; and a large part commonly remains behind, which soon attains its former bulk, and causes its preceding inconveniences. Perhaps, the operation might be performed with more exactness, and success, if an opening were previously made into the trachea by bronchotomy. Then the patient might breathe through the aperture; the polypus might continue in the mouth during the whole cure, until detached; and, perhaps, might be tied close to its root, by means of a curved tube. Experience (adds Richter) must decide, whether this plan is advantageous, and practicable.

Polypi in the rectum may be felt by the fingers. The first suspicion of them arises from the impediment to the evacuation of the excrement. They are to be tied with the aid of the cannulæ. Excrescences in the meatus auditorius externus, resembling polypi, have been successfully extirpated by extraction; or rather by twisting them off.

For many of the foregoing remarks, I am indebted to Richter, who has very ably treated of polypi in his *Ansfangsg. der Wundarzn. Band.* 1, *Kap.* 21. See also *Pott's Remarks on the Polypus of the Nose. Whateley's Two cases of extraordinary Polypi. John Bell's Principles of Surgery, Vol.* 3, *Part* 1. *Encyclopédie Méthodique; Art. Polype. Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 528—538, *&c. Edit.* 1809. *Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 169, *&c.*

**PORRIGO.** See *Tinea Capitis.*

**PROCIDE'NTIA.** A prolapsus, or falling down of any part. (See *Anus, Prolapsus of; Uterus, Prolapsus of, &c.*)

**PROLA'PSUS.** A falling down of any part. Same as *Procidentia.*

**PROSTATE GLAND, DISEASE OF.**

According to Sir E. Home, the prostate gland is not a very sensible part. Dr. Baillie has seen a common abscess situated in it, and he says, that it is also subject to scrophulous disease, as, on cutting into it, he has met with the same white curdy matter, which is formed in a scrophulous absorbent gland. He has likewise forced out of its ducts scrophulous pus.

The most frequent disease of this part is a scirrhous enlargement of it, when, from its natural size of a chesnut, it becomes as large as the fist. When cut into, it exhibits a very firm whitish, or brown substance, containing membranous septa. Sometimes its external surface is ulcerated, though this is not often the case; and fistulous communications are occasionally formed with the rectum. A considerable enlargement of the prostate gland is attended with great difficulty of voiding the urine, and the muscular coat of the bladder becomes, in consequence of the efforts it has to make, very much thickened. This disease of the prostrate gland seldom occurs, except in old men, and is not so common as many suppose. Sir E. Home observes, that the morbid enlargement of the gland does not diminish the size of the passage into the bladder, but rather increases it. The lateral portions of the gland as they swell, widen the passage between them, rendering it of an oval form; it is therefore the projecting portion, from the lower part, which prevents the urine from flowing, and obstructs an instrument in its passage into the bladder. The obstruction, in some instances, arises from the two sides of the gland enlarging unequally; the larger portion pressing upon the smaller, which is made hollow to receive it, so that the passage winds round the projecting part, and this winding cannot be followed by an instrument.

Sir E. Home remarks, that a stricture may be distinguished from an enlargement of the prostate gland, by the following circumstances: the distance of the obstruction from the external orifice is to be determined by passing a soft bougie, which is to be left in the canal for a minute, so as to receive an impression from the obstruction. If the bougie does not pass further than seven inches, and the end is marked by an orifice of a circular form, (it is immaterial as to the size of the orifice,) the disease is certainly a stricture; but, if it passes further on, and the end is blunted, a disease in the prostate gland is to be suspected. This in general can be ascertained by a flexible gum catheter with a stilet, very much curved, passing into the bladder, which it will do, in most cases of enlargement of the gland.

Among the symptoms of a diseased prostate, we have also to mention, a difficulty of voiding the feces; an occasional discharge of a kind of mucus; an uneasy sensation about the rectum, after going to stool, as if more of the feces remained undischarged. The difference between the symptoms of a stone in the bladder, and those arising from disease of the prostate, is explained in the article *Lithotomy*.

The occasional retentions of urine, to which patients with disease of the prostate are subject, require the introduction of the catheter, and the surgeon will succeed in passing this instrument better, when he remembers, that the urethra, in consequence of the disease, makes a very sudden turn upward, just before it terminates in the bladder.

The enlargement of the prostate gland may often be felt by passing a finger into the rectum. Surgeons are unacquainted with any certain mode of diminishing the scirrhous enlargement of the prostate gland. The *pilulæ hydrargyri cum cicutâ* have been recommended. (See *Pilulæ.*) Sir E. Home mentions a case, in which suppositories of opium and hemlock, passed up the fundament, and allowed to dissolve there, gave more relief, than any other plan; they not only lessened the irritation, but produced a diminution of the projection of the gland.

Some abscesses, and ulcerations of the prostate, in consequence of strictures, may be cured, by removing the latter disease.

The prostate gland has occasionally small calculi in its ducts: but, the disease is so uncommon, that authors have not ascertained the particular symptoms, &c. I shall conclude with referring to *Baillie's Morbid Anatomy; Home on Strictures, Vol.* 1, *and on Diseases of the Prostate Gland.*

**PSEUDOSYPHILIS.** (from ψευδης, false, and *Syphilis*, the venereal disease.) Disease, resembling the venereal, but not really of this nature. The spurious venereal disease. (See *Venereal Disease.*)

**PSOAS ABSCESS.** See *Lumbar Abscess.*

**PSOROPHTHALMY.** (from ψωρα, the itch, and οφθαλμια, an inflammation of the eye.) An inflammation of the eyelids, attended with ulcerations, which itch very much. By psorophthalmy Mr. Ware means a case, in which the inflammation of the eyelids is attended with an ulceration of their edges, upon which a glutinous matter lodges, incrusts, and becomes hard, so that, in sleep, when they have been long in contact, they become so adherent, that they cannot be separated without pain.

Mr. Ware remarks, that "the ulceration in the psorophthalmy is usually confined to the edges of the eyelids; but, sometimes, it is seen to extend over their whole external surface, and even to excoriate the greater part of the cheek. In cases of the latter kind, the inflammation which accompanies, has often much the appearance of an erisypelas, and will receive most relief from cooling applications. The use of the citrine ointment, which will hereafter be recommended, must, in such instances, be deferred until the irritability of the skin is in a good degree abated.

"This disorder is also, sometimes, attended with a contraction of the skin of the lower eyelid; in consequence of which, that lid is drawn down, and the inner part turned outward, so as to form a red, fleshy, and most disagreeable appearance, called ectropium. Whenever this happens, it proves the complaint to be of the most obstinate nature; though it is generally removed by the cure of the psorophthalmy, which is the occasion of it." (*Remarks on Ophthalmy, &c. p.* 112.) Mr. Ware recommends, for the cure of this disease, the unguentum hydrargyri nitrati. This is to be melted into an oil, and rubbed with the end of the forefinger, or the point of a small pencil-brush, into the edges of the affected eyelids, once every night, on going to bed. A plaster of ceratum album is then put over the eyelids to keep them from adhering together. If they should still adhere in the morning, he advises cleaning them with milk and butter, well mixed together. In a few cases, it is necessary to touch the ulcers, formed on the edge of the eyelid, after the small-pox, with the argentum nitratum. When the globe of the eye is inflamed, use the thebaic tincture, as directed in the article *Ophthalmy.* In scrophulous subjects, alterative medicines; an issue, or perpetual blister; and attention to diet, &c. are proper. (See *Ware on Ophthalmy, &c.*)

**PTERYGIUM.** (dim. of πτερυξ, a wing.) Scarpa accurately remarks, that surgeons apply the term "*pterygium*" to that preternatural, reddish, ash-coloured, triangular little membrane, which most frequently grows from the internal angle of the eye, near the caruncula lachrymalis, and gradually extends over the cornea, so as to cause considerable impediment to vision.

Though the pterygium most commonly proceeds from the internal angle, it is observed to arise sometimes from the external one, and, in some instances, from the superiour, or inferiour hemisphere of the eye-ball. But, whatever be its origin, its figure is invariably that of a triangle, with its base on the white of the eye, and its apex more or less advanced over the cornea, towards its centre, and that of the pupil. Indeed, there are a few cases, in which two, or three pterygia of different sizes occur on the same eye, and are arranged round its circumference at interspaces of various breadths. Their points are directed towards the centre of the cornea, and if they should unfortunately conjoin there, the whole of that transparent membrane becomes covered with an opaque veil, and a total loss of sight is the consequence. It seems to Scarpa, that the term "*pannus*" was applied by the ancients to exactly this sort of complication.

Strictly speaking, chronic varicous ophthalmy, with relaxation, and thickening of the conjunctiva; opacity of the cornea; and the pterygium; only differ in the degree of the disease. In reality, all the three complaints consist of a more, or less extensive varicous state of the vessels of the conjunctiva, combined with a degree of preternatural relaxation, and thickening, of that membrane.

In chronic varicous ophthalmy, the extraordinary amplitude, and knottiness of the vessels; the flaccidity, and thickening of the conjunctiva; are limited to the white of the eye. In opacity of the cornea, certain veins even dilate, and become knotty, for some way, over that delicate layer of the conjunctiva, which is continued over the surface of the cornea. In the pterygium, an extraordinary swelling of this subtile membranous expansion is added to the varicous state of its veins. Hence, the pterygium seems at first like a new membrane formed on the cornea, while it is really nothing more, than the delicate continuation of the conjunctiva just mentioned, deprived of its transparency, and degenerated, in consequence of chronic ophthalmy, into a thick, opaque membrane, on which there is a plexus of varicous blood-vessels. Consequently, in the case of pterygium, there is no new production on the eye, but only an alteration of one of the thin, transparent membranes, which naturally cover it. The following circumstance, as will be more fully explained presently, illustrates, says Scarpa, the veracity of the preceding statement. The incipient pterygium may be cured in the same manner as opacity of the cornea, viz. by merely cutting off that portion of it, which is situated at the junction of the cornea with the sclerotica, without detaching the whole of it from the surface of the former membrane; just as is practised in opacity of the cornea, in order to destroy the communication of the varicous veins of the conjunctiva with their trunks, the ramifications of which produce, and maintain the disease.

Scarpa observes, that the pterygium would be as common a complaint as the varicous chronic ophthalmy, so often occupying the white of the eye, if the delicate continuation of the conjunctiva, over the surface of the cornea, were not naturally of a denser, and more compact texture, than the rest of the membrane, from which it is produced, and if its vessels were not very minute, and delicate, and not so dilatable as those of the other part of the conjunctiva. This is the reason why the pterygium is comparatively a rare case, in respect to the great frequency of varicous, chronic ophthalmies. But, should the vessels of the transparent layer of the conjunctiva once yield to the impulse of the fluid propelled into them; should they once become varicous; the cellular texture, in which they are enveloped, never fails to swell gradually, and, thus, the delicate, diaphanous membrane in question, changes into a pulpy, reddish tunic, precisely similar to the pterygium.

That the pterygium is truly nothing else but the natural, delicate, transparent expansion of the conjunctiva, on the cornea, converted, for a certain extent, into a pulpy, flaccid varicous membrane, may be inferred (continues Scarpa) from the folds, which the pterygium and conjunctiva form at the same time, when the morbid eye is turned towards the origin of the disease. The same inference is equally deducible from the tension occasioned in both these parts, whenever the eye is moved in the opposite direction. We become still more convinced of the fact on observing, that in the first position of the eye, both the pterygium and the corresponding portion of the conjunctiva (which is equally relaxed, varicous, and reddish), may be easily taken hold of with a small pair of forceps, and raised together in the form of a fold.

When the pterygium is met with in the dead subject, on carefully cutting off, and detaching, that flaccid, and thickened portion of the conjunctiva, in the white of the eye, which corresponded to the part of the cornea in the state of opacity from the pterygium, Scarpa has constantly found, that the pterygium might be separated, with equal facility, both on the white of the eye, and the cornea. The latter membrane was evidently denuded at the seat of the disease, being no longer covered with the transparent continuation of the conjunctiva. But, Scarpa has never been able to deprive the cornea of its natural covering, beyond the limits of the pterygium. Also, when several pterygia occur on the same eye, with interspaces between them, as many flaccid, varicous, pulpy places appear in the conjunctiva on the bulb, and constitute the basis of the pterygia; while the rest of this membrane, covering the white of the eye, continues smoothly spread over the ball, and no varicous blood-vessel is perceptible on the anteriour hemisphere of the eye, except where the relaxation of the conjunctiva, and the knottiness of the vessels, have implanted, as it were, the distant roots, and rudiments of the pterygium.

The pterygium, whether large, or small,

and whatever its situation may be at the circumference of the eye-ball, constantly retains its triangular shape, with its base on the white of the eye, and its apex on the cornea. The constancy of this fact seems to Scarpa attributable to the increasing degree of firmness, with which the subtile, transparent layer of the conjunctiva adheres to the surface of the cornea, as it proceeds from the circumference to the centre of that membrane. The following consequences must necessarily result from this sort of structure, and the different degree of cohesion, actually existing in healthy eyes. 1. The progress of the pterygium must be slower in every instance on the cornea, than on the white of the eye. 2. As the pterygium always meets with augmented resistance, in proportion as it endeavours to approach the centre of the cornea, it must from mechanical necessity assume the form of a triangle, with its base on the white of the eye, and its apex directed towards the centre of the cornea. Forestus (*Oper. Med.*) has accurately noticed the circumstances of this appearance, and, he continues: *non cooperit oculum nisi in formâ sagittæ.*

From this invariable appearance, and figure of the pterygium, one of its principal diagnostic characters results, by which the true disease may be discriminated from false instances, and from every other soft, fungous, reddish excrescence, that obscures the cornea. For, on this membrane, excrescences sometimes form, which, from having the colour and consistence of a soft membrane, bear a very great resemblance to the pterygium, though they are really widely different, and, strictly speaking, consist of the texture of the cornea itself, degenerated into a soft, fungous substance. Such pellicles, however, not only almost always create a greater prominence on the cornea, than what accompanies the pterygium, but they are constantly of an irregular tuberous form, and never represent a triangle, with the apex pointing towards the centre of the cornea, like the genuine pterygium.

Another distinguishing character of the pterygium (continues Scarpa) consists in the facility, with which the whole of it may be taken hold of with a pair of forceps, and raised into a fold on the cornea. Every other kind of excrescence, attached to this membrane, continues firmly adherent to it, and cannot be folded, and raised from the surface of the cornea, in any manner whatever. This particularity is of the highest importance in the treatment of the disease; for, the genuine pterygium may be cured by simple means, while fungous excrescences of the cornea, can only be radically removed, and perfectly cicatrized with the utmost difficulty. Plenck very properly observes, on this head: *Pterygia, quæ filamentis solummodò adhærent, facilè abscinduntur, difficillimè quæ ubique accreta sunt corneæ, ac in plicam elevari non possunt.* If this excrescence should adhere firmly to the cornea, be of a deep red colour, easily bleed on being touched, and cause shooting pains in the whole eye, and temple, though it be of a triangular figure, and constitute the true pterygium, it now threatens to assume a malignant cancerous nature, or has done so already. Hence, in the treatment, it is necessary only to adopt a palliative plan, or else extirpate the whole eye-ball.

The true, benign pterygium, says Scarpa, which has a triangular figure, is ash-coloured, or pale-red, is free from pain, and admits of being raised in the form of a fold on the surface of the cornea, may be cured by cutting the opaque triangular little membrane accurately from the surface of the cornea, which is in part covered by it. But, as it appears, from what has been said, that the pterygium is nothing, but a portion of the delicate, transparent layer of the conjunctiva converted by chronic varicous ophthalmy into a thick, opaque tunic, it follows, that the pterygium cannot be removed in any way, without the spot, which it occupies on the cornea, being bereft of its natural external covering. Also, as this denudation of the cornea renders a cicatrix unavoidable at the place, it equally follows, that the knife cannot be employed in the cure of the disease, without the cornea being rendered more or less opaque at the part, where the pterygium was before situated. Hence, Scarpa cautions young surgeons not to allow themselves to be deceived by the specious accounts of authors, who assert, that they have removed pterygia with the scalpel, and entirely restored to the cornea its former natural transparency. It is true (says he) that, after the removal, and cure, of the pterygium, the cornea at the part affected becomes less opaque, than it was before; but, the place always continues dim, and clouded with an indelible, though a superficial cicatrix. The amendment, derived from the operation, cannot but be considerable; by means of the incision, and firm cicatrix, a stop is put to the progress of the complaint, or rather to the increase of the varicous affection, and swelling, of the thin, transparent layer, of the conjunctiva, situated on the cornea; the local cause of irritation, and inflammation of the eye, is entirely obviated; and, thus, complete opacity of the cornea is prevented. But should it ever have happened after the recision of a large pterygium, that the patient regained his sight, we are to understand a certain degree of vision; in that proportion (Scarpa wishes to signify) which exists between a dense membrane, which entirely obstructs the passage of the light, and a slight, superficial cicatrix of the cornea, which does not intercept it altogether.

Scarpa's experience enables him to state, however, that the superficial, indelible speck, remaining on the cornea, after the recision of the pterygium, is always less extensive, than the space previously occupied by the disease. This fact, says he, is a constant one, and, in the vast number of pterygia, for which he has operated, some had advanced over the cornea two lines, others two and a half, towards its centre. In all, the scar, and opacity, of the cornea, diminished after the cure was perfected, and never exceeded a line and a half, or a little more, in cases, in which the pterygia had been two lines in length.

The recision of the pterygium is a very easy operation. For this purpose, there is no occasion for a needle threaded with silk, which most surgeons recommend to be passed through the little membrane, in order to make a noose for raising the pellicle, which must be divided at its base. The plan is disadvantageous, as it prolongs the operation considerably, and, particularly, as the bleeding from the punctures prevents the operator from distinguishing, with the necessary clearness, the margin of the parts designed for removal. A pair of dissecting forceps, and a pair of sharp scissars, suffice for this operation.

It is customary (continues Scarpa) to remove the pterygium by making the incision on the cornea, and extending it over the white of the eye, as far as the base of the disease reaches on the conjunctiva; so that when the pterygium grows from the internal angle of the eye, most surgeons continue the section as far as the caruncule. This practice is disadvantageous, first, because it denudes too much of the white of the eye; secondly, because, in consequence of the large portion of the conjunctiva removed at the base of the pterygium, and, in consequence of the direction of the wound, the cicatrix in the white of the eye, forms an elevated fræнum, which, like a little cord, keeps the eye-ball approximated to the caruncula lachrymalis, and destroys the freedom of its motions, particularly, towards the external angle.

To avoid this inconvenience, Scarpa says, he has found it useful, in the treatment of pterygia with bases extending far in the white of the eye, to detach them at their apex, as far as the junction of the cornea with the sclerotica, and then to separate them at their base by a semicircular incision, comprehending one line in breadth of the substance of the conjunctiva, and made in a direction concentrical with the edge of the cornea. Scarpa has observed, that, in this mode of operating, the subsequent cure takes place sooner, than when the common method is adopted; the cicatrix occasions no sort of frænum, and the conjunctiva, circularly stretched by the cicatrix, lies smoothly over the white of the eye, and loses that relaxation, and varicous state, which are the groundwork of the pterygium. Such attention, however, is not requisite, when the pterygium is small, and its base does not extend far in the white of the eye.

Scarpa describes the operation, as follows: The patient being seated, an assistant behind him is to elevate the upper eyelid with the index and middle fingers of one hand, while he depresses the lower eyelid with the corresponding ones of the other. Supposing it the right eye, the operator is to stand, or sit down, just as he prefers, in front of the patient; and the former, after directing the latter to move his eye-ball towards the part corresponding to the base of the pterygium, is to seize the morbid membrane with a pair of forceps held in his left hand, and pinch it into a fold, at about one line from its apex. The duplicature is now to be raised, and drawn out gently until a sensation of something giving way is felt, which indicates the detachment of the pterygium from the delicate cellular texture, by which it is connected with the subjacent cornea. Next, by means of a pair of scissars in the right hand, the surgeon must dissect this fold, as closely as possible, from the cornea, proceeding from the apex towards the base of the pterygium. The section being completed to where the cornea and sclerotica meet, the fold is to be again elevated still more, and, with one stroke of the scissars, the pterygium, and the relaxed portion of the conjunctiva, forming its base, are to be detached, as concentrically, and closely to the cornea, as possible. This second incision will have a semilunar shape, the horns of which ought to extend two lines beyond the relaxed part of the conjunctiva in following the curvature of the eye-ball.

When the operation is finished, the surgeon must promote the hemorrhage, by washing the part with warm water, and then cover the eye, that has been operated on, with a pledget of dry lint, or lint moistened in the aqua vegeto-mineralis, supported by a bandage, that does not make too much pressure on the part.

If no particular symptoms arise, (continues Scarpa) such as pain, tension of the eye, considerable tumefaction of the eyelids, it is sufficient to wash the eye, and inside of the eyelids, three or four times a day with a warm lotion of mallows, and carefully keep these parts from being exposed to the air, without compressing them. If the symptoms just mentioned should afterwards occur, the antiphlogistic treatment must be adopted in its full extent, &c.

On the fifth or sixth day, at latest, after the operation, all the surface, from which the pterygium was cut, appears yellowish, and covered with a fluid, like mucus. This is a mode of suppuration (says Scarpa) peculiar to membranes in general, and particularly, to those of the eye. The edges of the wound, and the adjoining part of the conjunctiva, assume a reddish colour. Afterwards, the surface of the wound contracts more and more daily, so that, at length, it completely closes, and the cicatrix forms.

During the whole treatment, subsequent to the operation, there is no occasion to employ any other topical applications, but the warm lotion of mallows, three or four times a day. Numerous cases have convinced Scarpa, that astringent collyria, and the boasted powders of the florentine iris, and alum, cause great irritation to the eye operated on, and give rise to tumefaction, and a fungous-like state of the conjunctiva, which are impediments to the cure. What is still more incommodious, is, that such means produce fungous excrescences on the middle of the wound itself, which only admit of being repressed and cicatrized with difficulty. Scarpa has seen all these inconveniences arise from one single unnecessary application of the argentum nitratum. On the other hand, when a mere lotion of mallows is the only remedy employed in the treatment, the cure proceeds regularly; the yellowish surface of the incision diminishes daily, and in three, or, at most, four weeks, the wound is quietly healed. The vitriolic collyrium, containing a few drops of camphorated spirit of wine, can only be prudently instilled, three or four times a day, into the eye, for the purpose of strengthening the conjunctiva and its vessels, after the wound is perfectly cicatrized.

We have already repeated Scarpa's sentiment, that the incipient pterygium, strictly speaking, is nothing more than an opacity of the cornea, in which the venous vessels of the conjunctiva covering that part of the cornea, which is the seat of the disease, are somewhat more dilated, than in the case, to which the term, "*opacity*," is usually assigned; and also, that the density, and opacity, of the delicate layer of the conjunctiva are much more considerable, at the part affected, in the instance of pterygium, than in that of simple opacity of the cornea.

The incipient pterygium (adds this author) is not a dense, opaque membrane, but a pellicle as fine as a cobweb, interwoven in different places with varicous blood-vessels, the iris continuing tolerably visible behind it. In this early state of the pterygium, it is unnecessary to deprive the cornea of its natural covering; it is quite enough to cut off a portion of it, in order to intercept all communication between the dilated venous ramifications of the pterygium, and the varicous trunks in the white of the eye.

The recision, says Scarpa, is accomplished by cutting out, with a pair of forceps and scissars, a semilunar piece of the conjunctiva, at the point where the cornea and sclerotica conjoin, and exactly at the base of the incipient pterygium, just as is practised for opacity of the cornea. The recent pterygium is observed to disappear gradually after the operation, or to change into a slight dimness of the cornea, extending over a part of the space previously occupied by the disease. This opacity is commonly much more trivial, than what follows a cicatrix. Acrel, in his *Surgical Observations*, mentions having successfully treated an incipient pterygium in this manner. Scarpa has also tried the plan several times with success. *Scarpa sulle Malattie degli Occhi, cap.* 11. See also *Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 163, *&c. Edit. Hafniæ*, 1800. *Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 507, *et seq. Richter's Anfangsgr. der Wundarzneykunst, Band* 3, *p.* 141, *&c. Gottingen*, 1795. *Sabatier, De la Médecine Opératoire, Tom.* 2, *p.* 190, *Edit.* 2. *Delpech, Précis des Maladies reputées Chirurgicales, Tom.* 3, *p.* 407, *&c. Paris*, 1816.

**PTOSIS.** (from ϖιπτω, to fall down.) An inability of raising the upper eyelid. The affection may be owing to several causes, the chief of which are a redundance of skin on the eyelid; a paralytic state of the levator muscle, a spasm of the orbicularis. Ptosis from the first cause may be cured by cutting away the superfluous quantity of skin. When the case depends on paralysis, the surgeon may try bathing the eye and surrounding parts with cold spring water, and rubbing the eyelid and eyebrow with any liniment containing a little of the tincture of cantharides. The linimentum camphoræ; the shower bath; and bark; may also be occasionally tried. The spasmodic ptosis requires antispasmodic medicines; the application of a blister to the temple; and fomenting and bathing the eye and eyelids with a decoction of cicuta, or poppyheads,

**PUNCTURED WOUNDS.** See *Wounds.*

**PUPIL, CLOSURE OF.** An inconvenience, not frequent indeed, but which however sometimes follows the opera tions of depression, and extraction, is a closure of the pupil in such a degree, that it becomes almost or quite shut, attended at first with a diminution, and afterwards with an entire loss, of sight.

This unpleasant occurrence, says Scarpa, is most frequently the consequence of a vehement inflammation of the internal membranes of the eye, especially, the iris, occasioned by the extraction, or depression, of the cataract. In some particular instances, this inconvenience follows one of these operations, but without the inflammation of the internal parts of the eye, and especially of the iris having any share in its origin, at least, as far as we can judge from appearances. In such circumstances, after an indeterminate time from the operation of depression, or extraction, the pupil is perceived to diminish in diameter daily, without any evident cause, so that at last it becomes, as it were, entirely obliterated, and that without the patient complaining of any uneasiness in the eye, if we except in a few individuals, a greater sensibility, than is natural, in the immediate organ of vision, even to a very moderate degree of light. In both cases, the pupil ordinarily closes so much, that it can hardly admit a small pin's head, and continues motionless; while within the situation of the pupil itself, the iris assumes a stellate, rugose appearance, with a little irregular aperture in the centre, behind which, when the cataract has been extracted, or depressed, the deeper part of the eye seems black; or, if a portion of the anteriour convexity of the opaque crystalline capsule should chance to remain behind after one of these operations, and has subsequently come into contact with, and adhered to, the posteriour surface of the iris, a small whitish speck, or veil, may be seen there.

Theory has induced some to suppose, that, when this morbid closure of the pupil originates from an excessive distention of the vessels of the iris, in consequence of severe inflammation affecting that membrane, it may be cured by means of local and general bleeding, purgatives, blisters, and a seton in the nape of the neck. On the other hand, they have deemed emollients, and internal and external antispasmodics, serviceable, in the instance of constriction of the pupil arising from spasm of the iris, and increased morbid sensibility of the immediate organ of sight, in consequence of the sympathy of the latter with the iris. But, how plausible soever these curative indications may seem to be for the closure of the pupil, practice has not admitted their efficacy. On the contrary, says Scarpa, it has clearly evinced, that this disease cannot be remedied, except by making an artificial opening in the iris, as a substitute for the natural pupil, now wholly, or partly obliterated, and as an aperture, which is to do the functions of the original one.

The young surgeon will probably have great difficulty in forming a judgment of the merits of the numerous methods of forming an artificial pupil, because, each plan is recommended by some great name, and supported by unquestionable examples of success; nor do I know at present how so many discordant opinions can be reconciled. Every writer describes his own method as the best. The truth is, each mode will succeed, when skilfully executed, and perhaps more depends on the manner of operating, than the kind of operation. Cheselden's plan is highly recommended by its ease and simplicity; while the modern observations of Ware, Adams, and Roux prove that the reason for which it was too hastily abandoned, viz. the closure of the opening again, is not well founded. Gibson's method is also simple and easy. I much doubt, whether the operations of Scarpa and Maunoir are better.

Before proceeding further into the subject, however, I think it will simplify it very much to state, that numerous as the plans of operating are, they may all be classed under three principal methods. 1. The simple transverse, or perpendicular incision of the iris. 2. The excision of a piece of this membrane. 3. The separation of a part of it from its circumference, or the ciliary ligament. (See *Roux*, *Parallèle de la Chirurgie Angloise*, &c. p. 286.)

To the best of Scarpa's knowledge, Cheselden was the first, who ventured to devise, and execute, a section of the iris, for the purpose of forming an artificial pupil. He introduced a couching needle, having a sharp edge only on one side, through the sclerotica, at the distance of a line and a half from the cornea, into the interior of the eye. After perforating the iris towards the external angle, and then pushing the point of the needle through the anteriour chamber of the aqueous humour, as far as that side of the iris, which is nearest the nose, he turned the edge of the instrument backward, and withdrew it, so as to make a transverse division of the iris.

It is related, that this operation was attended with the greatest success. However, Janin (*Mem. sur l'Œil*) assures us, that, having performed it on two subjects with the utmost care possible, he did not find the smallest benefit follow it; for, in these two patients, as soon as the symptoms, produced by the operation, subsided, he found the transverse section, made in the iris by the edge of the needle, re-united, and consolidated. Sharp had experienced the same thing, before Janin. (*On Operations, chap.* 29.)

An accident occurred to Janin, in the act of extracting a cataract; viz. he included the iris together with the cornea, in Daviel's scissars, and cut it perpendicularly. This circumstance taught him, as he expresses himself, that a perpendicular section, made in this membrane, on one side of the pupil, was the only truly efficacious method of preventing the edges of the wound of the iris from growing together again, so as to form a durable artificial pupil. This is exactly what led this oculist to make it an operative method, and to propose it, as the best expedient for making an artificial pupil. His plan consisted in opening the cornea, as is practised for the extraction of the cataract, and in dividing the iris perpendicularly with scissars, near that part of the pupil, which is next to the nose, and he affirms, that he has seen strabismus result from making the section towards the external side, on account of the too great divarication of the optical axes.

In the small number of cases of closure of the pupil, which Scarpa has seen and treated, as consequences of the operation of the cataract by extraction, or depression, he has never been able to make up his mind to open the cornea, in order to accomplish with scissars the perpendicular section of the iris, as proposed by Janin, or with the knife, as recommended by any other person. He has felt conscious of the frequent severe symptoms, which arise from making an opening into the cornea, when the eyes have already been affected, after the first operation, with violent internal ophthalmy, spasm, and morbid increase of sensibility in the immediate organ of sight. He says, he will never cut the cornea again after the extraction of the cataract, lest an irregular cicatrix should be the consequence. He is the less inclined to do so, as he is convinced, that it is not so easy, as some may conceive, to divide the iris, with scissars, when it has become flaccid in consequence of the escape of the aqueous humour. Scarpa had had occasion to see more frequently, than once, the edge of the iris detached, by blows on the eye-ball, from the ciliary ligament, to the extent of two lines, and without any laceration of the body of this membrane. At the place where the iris had been separated from the ciliary ligament, he says, he had seen an oval fissure remain during the rest of the patient's life, and it might have answered every purpose of an artificial pupil, had not the immediate organ of vision, and the crystalline, in the instances alluded to, suffered too severely from the violence of the blow. In a case of prolapsus of the iris, through a small ulcer of the cornea, where the former part was very much dragged, in consequence of the large portion of it protruded, and the adhesion, which it had contracted with the edges of the ulcer of the cornea, Scarpa had remembered, that this same part, the iris, instead of being lacerated at its middle, had rather been detached, for a certain extent of its circumference, from the ciliary ligament, so as to produce there an artificial pupil, which was very serviceable to the patient after the cure of the prolapsus of the iris. Scarpa likewise called to mind, that in depressing a cataract, he had seen a similar separation of the margin of the iris from the ciliary ligament take place, in consequence of having merely pushed the opaque crystalline inadvertently against the internal edge of this membrane, at the moment, when the lens continually rolled round the spear of the straight needle, without his being able to seize it, so as to immerse and depress it deeply in the vitreous humour. Besides these circumstances, it had often occurred to him to observe in frequent dissections of the eye, that on taking hold of the iris with forceps, and pulling it, not only at a little distance from its greatest disk, but also at the very edge of the pupil, this delicate membrane more readily became detached from its junction with the ciliary ligament, than lacerated at its middle, although it is certainly of a very soft nature. Lastly, it cannot be doubted, that the iris is a membrane perfectly distinct from the choroides, and has a proper, though feeble, connexion with the ciliary ligament, independently of the union of the choroides with the same ligament.

All these considerations taken together, especially that of the feeble union of the iris with the ciliary ligament, and, consequently, of the greater facility of detaching the edge of the iris from the ligament, with which it is connected, than of lacerating the body of this membrane, have induced Scarpa to try a new method of forming an artificial pupil, when the natural one has become too much contracted, or quite obliterated, after the extraction, or depression of the cataract. This method of operating, consists in detaching, by means of a couching needle, a certain extent of the circumference of the iris from the ciliary ligament, without ever preceding this operation by a section of the cornea. The attempt met with success.

The patient being seated, and supported, as if he were about to have the operation for the cataract performed, a straight couching needle, not so large as that which most surgeons use, but slender, like that which Scarpa prefers, (see *Cataract*,) is then to be introduced through the sclerotica, at the external angle of the eye, about two lines from the union of this membrane with the cornea; and its point is to be pushed as far as the upper and inner edge of the iris; in other words, as far as that side of the iris which is nearest the nose. The needle advances nearly to the ciliary ligament, and the surgeon perforates the internal edge of the iris, at its upper part, so that the point of the instrument scarcely appears in the anteriour chamber of the aqueous humour, because, that part of the anteriour chamber being very narrow, the point of the instrument, how little soever it might advance beyond the iris, would enter the substance of the cornea. The moment the needle appears in the anteriour chamber, the instrument must be pressed on the iris from above downward, and from the internal towards the external angle, so as to bring it in a parallel line to the anteriour surface of the iris, for the purpose of detaching a portion of the edge of this membrane from the ciliary ligament. This separation being effected, the operator (continues Scarpa) must depress the point of the needle, in order to apply it to the inferior angle of the slit, that he has begun to make. Then the aperture may be enlarged at pleasure, by pushing the iris towards the temple, and withdrawing the needle from before backward, parallel to the anteriour surface of the iris, and the greatest axis of the eye. If, when this detachment has been accomplished, no opaque body should appear at the bottom of the eye, the needle is to be withdrawn altogether. If any portion of opaque capsule left behind after the depression, or extraction of the cataract, should afterwards advance, and present itself in the vicinity of the new pupil, the little opaque membrane must be reduced to fragments, and pushed through the artificial opening into the anteriour chamber, where, as we have shewn in the article *Cataract*, such membranous portions, or flakes of the capsule, are, in time, dissolved and absorbed with the aqueous humour, which is continually undergoing a renovation.

This separation of the iris from the ciliary ligament, invariably occasions an extravasation of blood, which always renders the aqueous humour more or less turbid; but the turbidness is afterwards absorbed, and the eye recovers its original transparency.

The patient, says Scarpa, complains, during the operation, of a vast deal more suffering, than at the time when he undergoes the extraction or depression of a cataract. It cannot be otherwise; for, in detaching a part of the edge of the iris from the ciliary ligament, some filaments of the ciliary nerves, which proceed to be distributed to the iris, must at least be dragged, or lacerated. However, on the whole, the symptoms consequent to this operation, have neither been obstinate nor fatal in the two cases which Scarpa has seen. From some experiments made on the dead subject, Scarpa thinks the curved needle, which he uses for the depression of the cataract, would also be better than the straight one for making an artificial pupil; a thing which he intends to ascertain the first favourable opportunity. (*Scarpa sulle Malattie degli Occhi, Capo* 16.)

In the year 1811, the late Mr. Gibson of Manchester published an account of a new method of forming an artificial pupil. It is described as follows: "The first step of the operation is to secure the eyelids, as in the operation for extracting a cataract. A puncture is then to be made in the cornea, with a broad cornea knife, within a line of the sclerotica, to the extent of about three lines. All pressure is now to be removed from the eyeball, and the cornea knife gently withdrawn. The consequence of this is, that a portion of the aqueous humour escapes, and the iris falls into contact with the opening in the cornea, and closes it, like a valve. A slight pressure must now be made upon the superior and nasal part of the eye-ball, with the fore and middle finger of the left hand, till at length, by an occasional and gentle increase of the pressure, or by varying its direction, the iris gradually protrudes, so as to present a bag of the size of a large pin's head. This protruded portion must be cut off with a pair of fine curved scissars, and all pressure at the same time removed: the iris will then recede within the eye, and the portion, which has been removed, will leave an artificial pupil more or less circular." (*Gibson's Practical Observ. on the Formation of an Artificial Pupil, &c. London*, 1811.) Such was this surgeon's mode of operating, when the closure of the pupil was attended with central opacity of the cornea, uncombined with adhesions. The effect of a slight adhesion of the inner border of the iris to the cornea, will be to prevent the protrusion of the first of these membranes through the puncture in the cornea, which protrusion so much facilitates the operation. In this case, a portion, which does not adhere, must be drawn out with a small hook and then removed. Sometimes the adhesion may be separated at the time of making the puncture, and then the iris will protrude. When the whole, or greater part of the inner border of the iris is involved in adhesions to the cornea, these must be separated with the cornea knife after making the puncture, and the iris may then either be drawn out with the hook, or a portion of it be removed by means of very minute scissars. In every case, however, the removal of a portion is essential to success.

When a cataract is known to exist, which it cannot often be, Mr. Gibson recommends it to be depressed, or broken to pieces with the needle, before making the artificial pupil; and, when the whole cornea is transparent, he advises forming a flap in the centre of the iris with the cornea knife, and then cutting such flap off with the iris scissars. (*Gibson, Op. cit.*)

In 1812, Sir W. Adams recommended the revival of Cheselden's method of forming an artificial pupil, with the difference of using for the purpose a particular sort of knife. " With a cataract needle (says this oculist) I could not cut through the iris by a gentle force; and, if I ventured to apply a greater force, the iris separated from its attachment to the ciliary ligament, which rendered all further attempts to effect a central aperture useless. The same accident appears to have happened to Mr. Sharp in his trials of this operation. In the hopes of procuring an appropriate instrument, I twice went to London, at the interval of a few months; but, though I described to different instrument-makers the purposes for which it was intended, still I could only procure the needle, which cuts on one edge, and the spear-pointed knife, of different sizes, described by Cheselden. At length, it occurred to me, that the curved edge of the common dissecting scalpel was well adapted to cut with facility. I therefore, when in London, a third time, got a small knife made, two thirds of an inch in length, and nearly a line in width, with a straight back, sharp point, and a curved edge, which cuts back towards the handle for about three lines." (*Adams's Pract. Obs. on Ectropium, &c. p.* 30.) According to this gentleman, in all cases, where there is no crystalline lens, and the cornea is free from opacity, the division of the iris should be made in the centre, and should extend across at least two thirds of its transverse diameter. The eye being gently fixed with a concave sort of speculum, placed under the upper eyelid, the artificial pupil knife is to be introduced through the coats of the eye, about a line behind the iris, with its cutting edge turned backwards. The point is next to be brought forward through the iris, somewhat more than a line from its temporal ciliary attachment, and cautiously carried through the anterior chamber, until it has nearly reached the inner edge of that membrane, when it should be almost withdrawn out of the eye, gentle pressure being made with the curved part of the cutting edge of the instrument against the iris, in the line of its transverse diameter. If, in the first attempt, the iris should not be sufficiently cut, the point of the knife is to be again carried forward, and similarly withdrawn, until the incision is of a proper length. After the operation, the eye is to be covered with a plaster of simple ointment, and the patient put into bed, with his head raised. (*P.* 36—37.) When the closure of the pupil is attended with a cataract, the primary steps of the operation are the same; but, Sir William Adams takes care also to cut the cataract into pieces, some of which he brings forward into the anterior chamber, while others he leaves in the opening of the iris, where they at first serve as a plug, hindering union by the first intention, (*P.* 38.) and are afterwards absorbed. For an account of this gentleman's particular methods in all the various complications of these cases, the reader must consult the above-mentioned publication. Many successful examples of the operation are there recorded.

That Cheselden's method was undeservedly rejected, there can now be no doubt. Like all other modes of forming an artificial pupil, it cannot be expected to answer in every instance. Besides the authority of Sir W. Adams, we have the testimony of Mr. Ware, to prove, that Cheselden's operation frequently succeeds. This gentleman informs us, that, when the pupil has become closed, after an unsuccessful operation of extracting the cataract, he has in several instances made a new pupil, agreeably to Cheselden's mode of performing the operation, with the most perfect and striking success. " The fibres of the iris retracted as soon as they were divided, and left the pupil very nearly of its natural size. Its shape was not quite round; but, the sight was immediately restored, and to so great a degree, as to enable the patient, by the help of suitable convex glasses, to see distinctly both near and distant objects, neither pain nor inflammation being consequent to the operation."

In a modern work, Professor Maunoir of Geneva, has published a very successful case, in which an artificial pupil was formed, and a caseous cataract extracted. " I operated, (says M. Maunoir) on the right eye in the following manner. The patient being seated on a chair, and having the head inclined upon a cushion, I placed myself behind him, and with the fore finger of the left hand, confining the upper eyelid, whilst an assistant depressed the lower; I made with the right hand a semicircular incision in the lower and external part of the cornea. This incision occupied a full third of the circumference of the membrane. On re-opening the eye, the iris was seen projecting a little from the wound in the cornea. I replaced it with the blunt point of my scissars. Introducing the two blades closed into the anterior chamber, and then opening them, I caused the pointed blade to penetrate the iris, leaving the blunt blade between that membrane and the cornea; then closing the scissars, a perpendicular incision of the iris resulted, describing a little more than half the chord of an arc of two fifths of the circumference of the iris, traced on the side of the temple. The first incision not having occasioned the formation of a pupil of the necessary size, I introduced the scissars into the iris a second time a little obliquely; and immediately the pupil appeared of a satisfactory form and size, but exhibiting the crystalline entirely opaque. The second stroke of the scissars had divided the capsula: I therefore introduced a small curette, in order to endeavour to destroy what adhered of the crystalline to the shrunk and contracted circumference of the old pupil. This attempt did not succeed. Lastly, I effected the passage of a portion of the opaque lens, by means of a slight pressure with a large scoop, exercised on the lower part of the globe of the eye. The crystalline, which was of a cheesy consistence, came out with the greatest ease, and though it was not entirely removed, yet a sufficient quantity was discharged to leave the artificial pupil of a most perfect black. This new pupil was on the side of the temple; and at the exterior and lower part of the iris." (See *Medico-Chir. Trans. Vol.* 7, *p.* 305, *et seq.*) In this communication are also two other cases, in which Professor Maunoir operated, with success, though complicated with cataracts, and adhesions of the lens to the iris. In some remarks annexed by Professor Scarpa to the preceding account, the latter expresses his opinion, that it is not necessary to be scrupulous, whether the crystalline be partly, or entirely opaque, whenever the capsule is opaque, and adheres to the iris, behind the edge of the interior and inclosed pupil. " In this case only one remedy can be pointed out, namely, the removal of the opaque adherent capsule, and consequently of the crystalline, whether it be transparent, or opaque. In the second place, (says Scarpa) I think there is no reason to doubt, that, in similar cases, it is advisable to make an incision upon the iris, proportioned to the size of the body to be extracted, rather than to make it small, which obliges the operator to divide the crystalline and the capsule, with the intention of extracting a part, and of abandoning the rest to the powers of absorption. Thirdly; I would establish as a fundamental principle, in similar cases, that, after the complete extraction of the crystalline, with its opaque capsule, by means of the least possible introduction of instruments, the artificial pupil ought not to be too near the incision in the cornea, and consequently not too near the cicatrix occasioned by it." (*P.* 317) Scarpa then recommends a particular method of operating, in cases where there are cataracts: after having made, in the manner of Wenzel, a transverse incision in the iris, and in the cornea, he would introduce Maunoir's scissars, blunted at both points, into the anterior chamber of the aqueous humour, and make an incision in the iris, diverging from the cut made with the knife. The aperture thus made, Scarpa thinks would be large enough to allow easy egress to the opaque lens.

Amongst other late opinions, professed by this distinguished surgeon, we find the following: that no instrument is so proper as the scissars for making an incision in the iris; that, when the case is not complicated by cataract, a very small wound in the cornea is sufficient; that the formation of a triangular edge in the iris, by means of a double incision with the scissars, is the most easy and least painful of all the methods hitherto proposed for obtaining a *permanent* artificial pupil; and, lastly, that spots of the cornea present no obstacle, because it is possible to produce the artificial pupil opposite the transparent part of that membrane. (*Med. Chir. Trans. Vol.* 7, *p.* 320—321.)

*Consult Cheselden's description of his plan of operating in the Philosophical Transactions for* 1735, *p.* 451, *&c. Sharp's Operations, Chap.* 29. *Janin, Mém. sur l'Œil. Richter von der Verschossnen Pupille, in Anfangsgr. der Wundarzneykunst; B.* 3, *Kap.* 9, *Gottingen,* 1795. *Scarpa sulle Malattie degli Occhi, Cap.* 16. *Gibson's Practical Observations on the Formation of an Artificial Pupil, &c. London,* 1811. *Wenzel on the Cataract. Warner on the Human Eye. W. Adams's Pract. Observations on Ectropium, and on the Modes of forming an Artificial Pupil, &c. London,* 1812. *Roux Parallèle de la Chirurgie Angloise, &c. p.* 283, *&c. Paris,* 1815. *Professors Maunoir and Scarpa, in Medico. Chir. Trans. Vol.* 7, *p.* 301. *&c. Also G. Jos. Beer, Ansicht der Staphylomatosen Metamorphosen des Auges, und der kuntslichen Pupillenbildüng, Wien,* 1815. *Also Assalini, Ricerche sulle Pupille Artificiali, con cinque Tavole, &c.* 1811.

**PUS.** (from ϖυον, matter.) The fluid formed by the process of suppuration. See *Suppuration.*

# R

**RACHITIS.** (from ϱαχις, the spine of the back, because the disease was once supposed to depend on disease of the spinal marrow.) The rickets. See this word.

**RANULA.** (dim. of *rana*, a frog.) A whimsical name applied to a tumour under the tongue, arising from an accumulation of the saliva in the ducts of the sublingual gland. The term has either been derived from an imaginary resemblance of the swelling to a frog, or from the disease making the patient, as it were, croak when he attempts to articulate. The writers, who have treated of this disease, before it was known, that the parts affected by it were destined for the secretion of the saliva, have had no accurate notions of its true nature. Celsus has been supposed to have alluded to the ranula, in the fifth section of his seventh book, where, after treating of the diseases of the tongue, he continues with the following passage: *sub linguâ quoque interdum aliquid abcedit, quod fere consistit in tunicâ, doloresque magnos movet.* The latter circumstance, however, renders it probable, that some other affection was alluded to, as a ranula is rather attended with a sense of restraint, than of pain. Various erroneous sentiments were entertained, concerning ranula, by authors, who treated of it subsequently to Celsus. Paré thought it proceeded from an accumulation of a pituitary, cold, viscid matter, which descended from the brain beneath the tongue. Fabricius ab Aquapendente considers the ranula as an encysted tumour of the meliceris kind. Dionis is of a similar opinion. Munick, better acquainted with the modern discoveries of anatomy, does not mistake the nature of the present disease; and he expressly says, that the affection originates from a thick, acrid saliva, which, not being able to pass out of the salivary ducts, accumulates under the tongue, so as to cause a swelling in that situation. Far from adopting the opinion of Munick, Heister fell back to that of Fabricius, and borrows every thing from this author.—Lastly, De La Faye, in his notes on Dionis, has taken up Munick's sentiments; he says, that, "there are two sorts of ranulæ; some, which are round, and situated beneath the tongue, seem only to be produced by a dilatation of the excretory duct of the sublingual gland; the others are longer, than they are round; are situated at the side of the tongue, and are formed by a dilatation of the excretory duct of the inferior maxillary gland. The fluid, which fills such tumours, is the saliva which lodges and gradually accumulates in them, in consequence of its viscidity and the atony of the duct.

The ranula is said to be frequently met with in persons who move their tongue a great deal, and in those who sing. The fluid in the tumour is precisely like white-of-egg; but, it is thicker after having remained a long while in the swelling; it is occasionally of a calcareous, and even stony nature. Modern surgeons are of opinion, that the ranula does not proceed from an inspissation of the saliva, but from an obliteration of the duct, or orifices of this tube. The collection of saliva often produces a tumour of very large size; but, it generally bursts when it has attained the dimensions of a walnut, and then leaves an ulcer, which cannot be healed while the real cause of the disorder remains unknown.

Mr. B. Bell mentions his having seen an ulcer of this kind treated with the utmost care for several months; various detergent and corrosive applications had been employed; and even a mercurial course was resorted to; but all in vain. At length, the true cause of the disease having been ascertained, a cure was accomplished in a few days, by removing a piece of calcareous matter, which by obstructing the ducts, had first caused a swelling, and then the ulceration which ensued.

The edges of the opening very often close again, especially when it has been made with a lancet, and not of sufficient size. In this case, the swelling makes its appearance again, some time afterwards. M. Louis observes, that the ancients have made the same remark; and hence, Paré preferred the actual cautery to the lancet. Dionis also mentions having seen ranulæ, which recurred in consequence of a mere opening having been made with a lancet; and he recommends, for the prevention of this, applying a mixture of honey of roses, and vitriolic acid to the inside of the cyst, so as to destroy it. M. Louis remarks, that all authors seem to regret, that the situation of the tumour should prevent the sac from being totally dissected out. The success, which Fabricius ab Aquapendente experienced, when he merely opened the tumour its whole length, did not free him from this prejudice; and Heister says, he should prefer extirpation, if the nature of the adjacent parts, which would be wounded, were not a formidable objection. But, if this pretended cyst, this pouch, is nothing else than the gland itself, or its duct, dilated by the retention of the saliva, its inside should not be irritated. Whenever a sufficient opening is made, no relapse takes place. Munick particularly advises such an incision, and Rossius mentions the smallness of the opening, among the defects in the treatment, and its being a cause of the disease returning. However, he also recommends destroying the sac; but, specifies for the purpose, only astringent drying applications, which do not act in so powerful a manner.

In a ranula, there is nothing like a cyst which ought to be extirpated. It is enough to lay the cavity open, and occasionally to cut off the edges of the incision, when they will not otherwise unite. M. Louis always observed, that the radical cure depended on a fistulous aperture, through which the saliva continued to flow; and that, when this opening was situated behind the lower incisor teeth, a very annoying ejaculation of the saliva took place, in certain motions of the tongue. This inconvenience must be obviated, to render the cure complete. For this purpose, such an opening for the saliva must be made, as will not close. The perforation of the tumour with the actual cautery, was Paré's method; and thus a durable opening might certainly be obtained, for the excretion of the saliva, in a part of the mouth more backwards, so that patients would be freed from the disagreeableness of continually slobbering, or having their spittle ejected from their mouths in talking.

The ranula, when of long standing, is sometimes so large as absolutely to hinder a person from articulating. M. Le Clerc has recorded a case, in which the root of the swelling extended under the tongue; the tumour filled the whole mouth; the prominence it formed outwardly, was as large as a duck's egg; and the disease, in its progress, had made the teeth of both jaws project outward. At some parts of its surface, a fluctuation was perceptible; other places were exceedingly hard. The patient, who could hardly breathe, demanded assistance: and a puncture was made in the softest part of the outside of the swelling. A thick yellowish fluid issued out of the cannula. The opening was enlarged with a knife; and about a pint of gritty, inodorous matter was extracted. There was no hemorrhage from the cut; and, no sooner had the contents of the swelling been let out, than the patient began to articulate, which he had not been able to do for a long while. The sides of the tumour having been so prodigiously distended, M. Le Clerc thought it proper to destroy the inside of the cavity with a tent, dipped in a mercurial solution. The cure was completed in a month, and the tongue gradually regained its original size, a part of which it had lost.

But, as M. Louis observes, fortunate as the termination of this case was, it must not be indiscriminately set down, that destroying the cyst, or even opening the tumour, is always requisite. A more simple method will sometimes succeed. In a particular case, which this gentleman has related, a sinuosity, which divided the swelling into a right and left portion, made him suspect that it consisted of two sacs, in contact with each other. On each side, in front, and in the same line, there was a point, which was the orifice of the salivary duct, somewhat dilated, and blocked up with a viscid matter. Having very easily passed a small probe into the orifices, a matter, similar to white-of-egg, made its escape. A small leaden probe was passed into each opening, and, two days afterwards, the sacs were emptied again, and two pieces of lead, somewhat larger, introduced. The man was advised to take out the pieces of lead every morning, empty the swelling, and then replace them. In a fortnight, the openings, having been kept continually dilated, had no tendency to close; the saliva did not accumulate, and the ranulæ never appeared again.

In certain cases, the above means are quite inadequate, and the tumour must be totally extirpated. M. Boinet has related, to the French Academy, a case in which the swelling not only filled the whole mouth, but one half of the tumour projected out, and a cure could only be accomplished in the latter manner. The two upper incisor teeth, on the left side, were lodged in a depression observable there; and the canine tooth, of the same side, forced outward by the mass of disease, had pierced the lip near its commissure. A fluid, resembling mucus, flowed from a narrow aperture, at the lower part of the swelling. The tongue could not be seen, so much was it pushed backward; and, for some time, the patient had only subsisted on liquid food, which he was first necessitated to convey to the back of the throat, with some mechanical contrivance. The four incisor teeth, two canine, and first grinders of the lower jaw, had been pushed out of their sockets, by the pressure of the swelling. The patient's aspect was alarming, and he was threatened with suffocation. Extirpation was deemed necessary, and it was performed, with all the caution, which the situation of the tumour demanded. The large cavity thus occasioned, was filled with lint. The lower jaw being found diseased, M. Boinet scraped some of its surface off, and covered the places with lint, either dry, or dipped in spirit of wine. Some exfoliations followed, and the fungous granulations which grew, were repressed with proper applications. In three months, the parts were healed in so regular a manner, that the motion of the tongue was not in the least obstructed, and no change continued, except the alteration of the voice, occasioned by the loss of teeth. This case is very interesting, and shews how much may be hoped for in difficult cases, from prudent and judicious measures. (See *Encyclopédie Méthodique; Art. Grenouillette. Mem. de l'Acad. de Chirurgie, tom.* 3. *Sabatier's Médecine Opératoire, Tom.* 2. *p.* 19, *&c. Edit.* 2. *Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 100, *&c. Edit. of* 1800. *Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 402, *&c. Edit. of* 1809. *Richter's Anfangsgr. der Wundarzneykunst, Band.* 4, *Kap.* 1, *Edit. of* 1800.)

**RECTUM.** The last large intestine, terminating in the anus, is so named, from an erroneous opinion that it was straight, while, in fact, it is semilunar, being adapted to the concavity of the sacrum.

Piles, which are a disease of the veins of this bowel, are treated of under the term *Hemorrhoids.*

The rectum is also subject to have tumours formed in it. Mr. Hey mentions a young man, who had had, for two years, a swelling in this bowel. The tumour protruded from the anus, whenever the patient went to stool, and generally bled on the same occasion. The disease had been, from the first, attended with pain in the loins. On examination, Mr. Hey found the swelling to be of the size of a nutmeg, adhering to the intestine by a narrow basis. It was firmer in its texture than piles usually are, except when inflamed. The apprehension of a troublesome hemorrhage, led Mr. Hey to prefer tying the base of the swelling to cutting it away, and thus he successfully extirpated the disease. (*Practical Observations in Surgery, p.* 443.)

The *schirro-contracted* rectum is what we have chiefly to consider in the present article. Scirrhus of the rectum is not uncommon at an advanced period of life. Sometimes it extends over a considerable length of the gut, but generally it is more circumscribed. The coats of the bowel become much thicker and harder than in the natural state. The muscular is subdivided by membranous septa, and the internal coat is sometimes formed into hard, irregular folds. The surface of the inner membrane is occasionally ulcerated, so as to form a cancerous disease. Every vestige of the natural structure is sometimes lost, and the gut is changed into a gristly substance. The cavity of the bowel is always rendered narrow at the scirrhous part, and is, sometimes, almost obliterated. When the passage through the gut is very much obstructed, the bowel is always a good deal enlarged just above the stoppage, or stricture, from the accumulation of the feces there. As the disease advances, adhesions form between the rectum and adjacent parts, and ulcerations produce communications between them.

The disease is usually not much noticed till somewhat advanced, not being at first very painful. The patient only thinks, that he is costive, and that he voids his stools with a little difficulty. In time, a good deal of pain is felt in the part affected, especially at stool, after which, some relief is experienced. Pus and blood may sometimes be noticed with the excrement, particularly when the disease has advanced to the ulcerated state. The patient at length becomes sallow, the constitution suffers, and dissolution follows. Severe tenesmus attends the whole course of the disease.

Desault has often seen the disease form a communication between the rectum and vagina, and the feces have passed through the latter part. In the latter stage of the affliction, the rectum, bladder, vagina, uterus, and adjacent parts, are all involved in one common ulceration.

When the disease has attained the ulcerated state, it is probably always incurable. Palliatives can now only be resorted to, such as anodyne and emollient glysters, the warm-bath, &c. with the exhibition of medicines like opium, cicuta, uva ursi, &c. Claudius applied his remedies to the inside of the bowel, by means of tents, and did not employ the latter as a mode of curing the disease when less advanced. Valsalva used to introduce a cannula, pierced with numerous holes, when his patient got into the bath, so as to let the fluid enter the intestines. Numerous practitioners, among them Morgagni, made mercurials the base of their treatment, from a supposition that the complaint was of venereal origin.

When the disease is not attended with ulceration, the contraction and thickening of the gut may be diminished by introducing bougies, keeping them for a certain time, every day, so introduced, and increasing their size gradually. The pressure of these instruments seems to lessen the disease, and stop its progress; a proof that its nature differs from that of what is usually understood by scirrhus. Desault used to employ the long tents, made of lint, smeared with cerate, and passed into the bowel by means of a probe, with a forked end. This surgeon gradually increased the size of the tents, so as to continue the compression, to which he conceived all the good was owing. Their length was also augmented, by degrees. Fresh ones were, at first, introduced twice every day. When any hardnesses were situated on the outside of the anus, Desault cured them on the same principle, viz. by making pressure on them, with compresses and a bandage. This eminent surgeon effected a cure of a scirrho-contracted rectum by this method. The woman was taught to pass occasionally the tents herself, so as to prevent a relapse. The disease is said to afflict women more frequently than men; from a comparative table kept at the Hôtel-Dieu, this has been the case there in the proportion of ten to one.

A fatal case of mortification of the rectum is detailed by M. Larrey. (See *Parisian Chirurgical Journal, Vol. 2, p.* 398, *&c.*)

See *Baillie's Morbid Anatomy. Œuvres Chirurgicales de Desault par Bichat, Tom. 2, p.* 422. Also *Observations on the principal Diseases of the Rectum, &c. by T. Copeland,* 1814.

**RESOLUTION.** (from *resolvo.*) The subsidence of inflammation, without any abscess, ulceration, mortification, &c. Also the dispersion of swellings, indurations, &c.

**RETENTION OF URINE.** See *Urine, Retention of.*

**RETROVERSIO UTERI.** A turning backward of the womb. See *Uterus, Retroversion of.*

**RICKETS.** (*Rachitis.*) Is mostly met with in young children; seldom in adults. Morrand, however, (*Acad. des Sciences,* 1753,) mentions an instance in which an adult became affected. Pinel has given a description of the skeleton of a ricketty fœtus, (*Fourcroy's Journal.*) The disease seems to consist of a want of due firmness in the bones, in consequence of a deficiency in the phosphate of lime in their structure. The causes of the affection are involved in great obscurity. Authors have referred them to scrophula, scurvy, lues venerea, difficult dentition, &c.; and Richerand, one of the most eminent surgeons at Paris, still firmly believes, that rachitis is only one of the effects of scrophula in its worst forms. (*Nosographie Chir. T.* 3, *p.* 148. *Edit.* 4.)

But these are merely conjectures, which will not bear a rigorous investigation. Professor Boyer in particular has well exposed their invalidity. (*Traité des Mal. Chir. T.* 3, *p.* 611.)

Ricketty subjects are often at the same time scrophulous; and this is, probably, the only reason for scrophula being accounted a cause of the other affection. The particular appearances of ricketty children we need not detail, as every one is familiarly acquainted with them: such children are usually of a bad, weak constitution, and their limbs and bones become bent in directions determined by the action of the muscles, and the weight and pressure, which they have to sustain. When the affection is very general, the spine becomes shorter, and is curved in various directions; the breast becomes deformed, not only in consequence of the curvature of the spines, but by the depression of the ribs, and projection of the sternum. The bones of the pelvis fall inwards, and the os pubis generally approaches the sacrum. The latter circumstance is one of the causes of difficult parturition. The clavicles become more bent and prominent forward; the os humeri is distorted outward; the lower ends of the radius and ulna are twisted in the same direction; the thighs are curved forwards, or outwards; the knees fall inwards; the spine and front surface of the tibia become convex; and the feet are thrown outwards.

According to the observations of Mr. Stanley, when the tibia and fibula become curved, they sometimes "acquire increased breadth in the direction of the curve, losing a proportionate degree of thickness in the opposite direction. Hence, the bones become, as it were, newly modelled, passing from the cylindrical into the flattened form. This would seem to be designed for the purpose of enabling them to support more efficiently the weight of the body, since by this alteration they acquire increased breadth and power of resistance in that direction, where the greatest strength is required. I have never noticed (says Mr. Stanley) any expansion in the articular ends of ricketty bones, as is mentioned by some authors. I should therefore feel inclined to believe, that there has existed only the appearance of such a phenomenon, the ends of the bones having appeared swollen, in consequence of the emaciation of the surrounding soft parts." (See *Medico-Chirurg. Trans. Vol.* 7, *p.* 402—405.)

When the thoracic viscera are considerably oppressed by the alteration in the figure of the chest, produced by the rickets, the disease may bring on fatal consequences.

Boyer has thus described the appearances of ricketty bones: They are lighter, than natural, and of a red, or brown colour. They are penetrated by many enlarged blood-vessels, being porous, and, as it were spongy, soft, and compressible. They are moistened by a kind of sanies, which may be pressed out of their texture, as out of a sponge, or rather a macerated hide after it has been tanned. The walls of the medullary cylinder of the great bones of the extremities are very thin, while the bones of the skull are considerably increased in thickness, and become spongy, and reticular. All the affected bones, especially the long ones, acquire a remarkable suppleness; but, if they are bent beyond a certain point they break; &c. Instead of being filled with medulla, the medullary cavity of the long bones contains only a reddish serum, totally devoid of the fat, oily nature of the other secretion in the natural state. (See *Boyer's Traité des Maladies Chir. T.* 3, *p.* 619.) The consistence of several ricketty bones, examined by Mr. Stanley, was nearly that of common cartilage. They presented throughout an areolated texture, and the cells were in some parts large, and contained a brownish gelatinous substance. This gentleman did not find the periosteum thickened, as Bichat has described. (*Anatomie Generale, T.* 3.) The investigations of Mr.

Stanley has also discovered, that, in the process, by which ricketty bones acquire strength and solidity, there is always an undeviating regularity in the situation, extent, and direction of the deposited earthy matter. "Thus, it is obvious (says this gentleman) that, in the curved bone, the part where there is the greatest need of strength, to prevent its further yielding, is in the middle of its concavity, or in other words, in the line of its interior curve; and it is just in this situation, that strength and compactness will be first imparted to the bone by the deposition of phosphate of lime. It will be further found, that the greatest resistance being wanted at this part, the walls are accordingly rendered thicker here, than elsewhere, and the degree, to which this excess in thickness is carried, bears an exact ratio to the degree of curvature, which the bone has undergone."

Mr. Stanley's observations also prove, that the bony fibres are arranged obliquely across the axis of the bone, in a direction calculated to augment its strength. Lastly, we learn from the same authority, that if a long bone, like the tibia, be very much bent, while it has to support a great superincumbent weight, the deposition of the bony matter may not be confined to the thickening of the walls of the concave side, but may extend across the medullary cavity, rendering the bone here perfectly solid, and thereby greatly strengthened. (See *Obs. on the condition of the Bones in Rickets, &c. by E. Stanley, in Medico-Chir. Trans. Vol.* 7, *p.* 404, *et seq.*)

Many infants, which are very ricketty and deformed, improve as they grow up, and their constitutions acquire strength. The deformity of their limbs spontaneously diminishes, and the bones gain a due degree of firmness, resulting from a proper deposition of the phosphate of lime in their texture.

It is a question, whether the restoration of the proper figure of the bones can be promoted by the constant pressure of bandages, and mechanical contrivances, sold in the shops. (See *Distortion.*) Some authors contend, that in very young children machines are useless, as the confinement and inactivity of the muscles, necessarily occasioned by such contrivances, must increase the general debility, and consequently the disease.

Notwithstanding the praises, which have been bestowed on these mechanical means by their inventors, and even by respectable authors, says Boyer, they are not now used by any enlightened judicious practitioners, it being generally agreed, that it is best to leave to nature alone, aided by good medical treatment, the duty of rectifying bones deformed by the rickets. (*Traité des Mal. Chir. T.* 3. *p.* 627.) Delpech expresses himself still more strongly against the employment of machinery. (See *Précis Elémentaire des Maladies Chir. T.* 3, *p.* 740, *&c.*) These opinions, against mechanical contrivances for ricketty bones, are not meant to apply, however, to machines for rectifying distortions of the foot. In such cases, the malformation does not depend on constitutional causes, and mechanical means will do whatever is possible.

No medicine is known, which possesses any direct efficacy in cases of rickets.—Tonics are indicated, and should be employed. The state of the bowels must in particular be attended to. The disease appearing to consist in a deficiency of lime in the bones, proposals have been made to exhibit internally the phosphate of lime; but, this chemical project has had no success. (See *Bonhomme's Memoir on Rachitis,* and *Duncan's Annals for* 1797.) More good, however, may be effected by keeping children in healthy situations, and in a salubrious air, than by any medicines, whatever. Light, wholesome, nutritious, easily digestible food; cold bathing; good nursing; regular gentle exercise; or airings in a carriage; the use of the fleshbrush, &c. are also highly serviceable. The constitutional treatment of rickets belongs more properly to the physician than the surgeon; and it is not necessary to introduce more of the subject into a Dictionary expressly allotted to surgery.

See the article, *Mollities Ossium,* and consult particularly *Buchner de Rachitide perfecta et imperfecta Disput. Argent.* 1754. *Glisson, de Rachitide, sive, morbo puerili Tractatus; Lugd. Batav.* 1671. *Bonhomme's Mem. on Rachitis. Duncan's Medical Annals for* 1797. *Richerand, Nosographie Chirurgicale, Tom.* 3, *p.* 142, *&c. Edit.* 4. *Levéille's Obs. in Mém. de Physiologie et de Chirurgie par Scarpa, &c. Boyer's Traité des Maladies Chir. Tom.* 3. *p.* 607, *&c. Stanley's Obs. in Medico-Chir. Trans. Vol.* 7, *p.* 404. *Delpech Précis Elémentaire des Maladies Chir. Tom.* 3, *p.* 739, *&c.*

**RINGWORM.** See *Herpes.*

**RUPTURE.** A protrusion of the abdominal viscera. A hernia. See *Hernia.*

# S.

SABINA. (said to be named from the Sabines, whose priests used it in their religious ceremonies.) Savine. The use of the leaves of this plant, in forming the active ingredient in the ointment commonly preferred for keeping open blisters, we have explained in the article *Blisters*. The other chief surgical use of savine, is as a stimulating application for destroying warts, and other excrescences. For the latter purpose, it is generally powdered, and mixed with an equal proportion of ærugo æris. The same powder is also sometimes employed by surgeons for maintaining the hollows into which peas are inserted in issues. The best plan is, first to wet the peas, then roll them in the powder, and put them, in this state, on the issue. But, when the whole surface of the issue has risen high, above the level of the skin, the powder must be sprinkled all over the sore, so as to produce an absorption of the high granulations.—Indeed, even in this manner, a good cavity often cannot be obtained; and, it becomes necessary to destroy the surface of the issue, by rubbing it with the potassa, or potassa cum calce.

SACCHARUM SATURNI. Sugar of Lead. Cerussa Acetata. Acetite of Lead. This is very extensively used in surgery, chiefly as a local application to inflamed parts, and in the form of a lotion. See *Inflammation*, *Collyrium*, *Lotio*, *Gonorrhœa*, *Ophthalmy*, and numerous other articles of this Dictionary, for an explanation of the uses of acetite of lead.

SAL-AMMONIAC. *Ammonia Muriata. Muriate of Ammonia.* Employed a good deal by surgeons, as an ingredient in discutient lotions. See *Lotio Ammon. Mur.*

SALIVARY FISTULÆ. See *Parotid Duct.*

SA'NIES. (*Latin.*) A thin, serous matter, discharged from fistulæ, unhealthy sores, &c. It is sometimes tinged with blood.

SAPO TEREBINTHINÆ. (*Starkey's Soap.*) ℞. Kali præpar. calidi ℥j. Olei Terebinth. ℥iij.—The hot kali præparatum is to have the oil of turpentine gradually blended with it, in a heated mortar. Indolent swellings were formerly rubbed with this application, and, perhaps, some chronic affections of the joints might still be benefited by it.

SARCOCE'LE. (from σαρξ, flesh; and κηλη, a tumour.) A fleshy enlargement of the testicle. (See *Testicle, Diseases of.*)

SARCO'MA, or *Sarcôsis.* (from σαρξ, flesh.) A fleshy tumour on any part of the body. (See *Tumours, Sarcomatous.*)

SARSAPARI'LLA. The root of sarsaparilla was brought into Europe about 1530. It was at first reputed to possess singular efficacy in venereal cases; but, afterwards lost all its fame. Sarsaparilla was again brought into notice by Dr. W. Hunter, who advised Dr. Chapman to make trial of it in a bad case of phagedenic bubo; and the benefit, obtained in this instance, led Dr. Hunter to extend the recommendation of the medicine. Sir W. Fordyce stated, that sarsaparilla would quickly relieve venereal head-achs, and nocturnal pains, and if persisted in, cure them; that, in emaciated, or consumptive habits, from a venereal cause, it was the greatest restorer of appetite, flesh, colour, and strength, which he knew of; that when mercurial frictions had been previously employed, it would generally complete the cure of the disease of the throat, nose, palate, or spongy bones; and that it would promote the cure of blotches and ulcers, sometimes accomplish it, *even without mercury;* though, in this circumstance, there was danger of a relapse. Sir W. Fordyce said, sarsaparilla was of little use in chancres; but, when these or buboes, would not heal, after the employment of mercury, it would often cure, and always do good. He allows, however, that, in all venereal cases, *sarsaparilla is not to be trusted to, unless preceded by, or combined with, the use of mercury;* and he thought sarsaparilla would, probably, always cure what resisted mercury. (*Medical Obs. and Inq. Vol.* 1.)

The celebrated Cullen considered sarsaparilla as possessing no virtues of any kind; for, (says he,) "tried in every shape, I have never found it an effectual medicine in syphilis, or any other disease." (*Mat. Med. Vol.* 2.)

Mr. Bromfield declares, that he never saw a single instance in which sarsaparilla cured the venereal disease, without the aid of mercury, either given before, or in conjunction with it. (*Pract. Obs. on the Use of Corrosive Sublimate, &c. p.* 78.) Mr. Pearson also contends, that sarsaparilla *has not the power of curing any one form of the lues venerea;* but, he allows that it may suspend, for a time, the ravages of that contagion, the disease returning, if no mercury should have been used. This gentleman admits, also, that sarsaparilla will alleviate symptoms derived from the venereal virus. He maintains, that the exhibition of sarsaparilla does not diminish the necessity for giving less mercury. Nocturnal pains in the limbs, painful enlargements of the elbow and knee, membranous nodes, cutaneous ulcerations, and certain other symptoms, resembling venereal ones, are often experienced after a full course of mercury. Such complaints, Mr. Pearson allows, are greatly benefited by sarsaparilla, and exasperated by mercury; and, he observes, that it is from these complaints having been mistaken for venereal ones, that the idea has arisen, that sarsaparilla has cured syphilis, when mercury had failed. Mercury, and the venereal poison, may jointly produce, in certain constitutions, symptoms which are not strictly venereal, and are sometimes more dreadful, than the simple effects of syphilis. Some of the worst of these appearances are capable of being cured by sarsaparilla, while the venereal virus still remains in the system. When this latter disease has been eradicated by mercury, sarsaparilla will also cure the sequelæ of a course of the other medicine. (*Pearson on the Effects of various Articles in the Cure of Lues Venerea;* 1807.)

**SCA'LPEL.** (from *scalpo,* to scrape.) Originally a raspatory, or instrument for scraping diseased bones, &c. The term now generally signifies a common, straight, surgical knife.

**SCA'RIFICATION.** (from *scarifico,* to scarify.) The operation of making little cuts, or punctures, in a part, for the purpose of taking away blood, letting out fluid in anasarcous cases, or air, in instances of emphysema.

**SCIRRHUS; SCIRRHOMA; SCIRRHOSIS.** (from σκιρροω, to harden.) The etymological import of these terms seems merely to be any induration. The first is now generally restricted to the induration, which precedes cancer, in the ulcerated state.

**SCLERIASIS; SCLEROSIS.** (from σκληροω, to harden.) A hard tumour, or induration.

**SCRO'PHULA, or SCROFULA.** (from *scrofa,* a sow.) So named,because swine are said to be subject to it. Called also, *struma,* and the *King's evil.* A disease, one of the chief, or most palpable symptoms of which is a chronic swelling of the absorbent glands, in various parts of the body, which glands tend very slowly to a state of suppuration, that is almost always imperfect. Our notions of scrophula, however, would be very imperfect, were we to define the disorder to be a morbid state of the lymphatic glandular system. The first appearances, indeed, frequently consist of spots on different parts of the body, and of eruptions and ulcerations behind the ears. As a judicious author remarks, the system of absorbent glands, it is true, seldom, or never fails to become affected in the progress of the disease; but, there is reason to believe, that scrophula frequently appears, for the first time, in parts, which are not of a glandular nature. There are, perhaps, but few, if any, of the textures of the human body, or of the organs, which these textures form, that are not liable to attacks of scrophula, and to scrophula as an original idiopathic affection. (*Thomson's Lectures on Inflammation,* p. 134.)

Scrophula generally shews itself during infancy, between the age of three and seven; sometimes rather sooner; but, frequently, as late as puberty, and, in some instances, though a very few, not till a much more advanced period of life. In the latter cases, the disease is said to be rarely so complete, or well marked, as it is in young subjects.

It seldom attacks the glands in children under two years of age, though Dr. Thomson has seen it occur earlier than this. Dr. Cullen used to mention a case, in which the disease broke out in an infant only three months old; but, says Dr. Thomson, this is an uncommon event. But, though glandular scrophula occurs most frequently in children, it is by no means confined to that period of life. Dr. Thomson has even found the lacteal glands affected with scrophulous inflammation in persons of very advanced age. (*Lectures on Inflammation,* p. 136.) Probably, however, such patients had laboured under scrophulous complaints in their earlier days.

Scrophula is also as hereditary as any disease can be; that is to say, it is so as far as any particular kind of temperament, or constitution, can descend, more or less completely, from parents to children. Mr. White, in his treatise on struma, has strongly censured calling the disease hereditary; but, his observations only lead to these conclusions, that children, born of scrophulous parents, are not invariably affected with scropulous diseases; and that, sometimes, one child has some strumous affection, while the parents, and all the rest of the family, have no appearance of scrophulous habits. However, I should conceive, that neither Mr. White, nor any other writer will maintain the opinion, that scrophula does not much more frequently afflict the children of scrophulous parents, than the offspring of persons, who have always been perfectly free from every tendency to any form of this affliction. Too numerous are the facts which occur to my own mind, to allow me to entertain the smallest doubt, that scrophula runs very much in certain families. In this sense, I think the term *hereditary* perfectly accurate and allowable. But, at the same time, I beg the reader to understand, that I have no intention of questioning what seem to be irrefragable truths, viz. that the children of scrophulous parents often continue, as long as they live, entirely free from the disease; and that one child is sometimes afflicted, while its father, mother, brothers, sisters, and all the rest of its relations, have never had any tendency to strumous disorders.

When scrophula does not actually take place at a very early period of life, it is generally stated by writers on the subject, that the particular constitutions, in which there is a disposition to the disease, are, in a certain degree, distinguishable. In the individuals, possessing the disposition in question, a peculiar softness and flaccidity of fibre are remarkable; their hair is more frequently light coloured than dark; and their eyes are said to be more often of a blue, than any other colour. Their skin is generally very fine, and even handsome, both in regard to its outward texture, and complexion. Subjects with scrophulous constitutions frequently have a kind of thickening of the upper lip; this swelling is sometimes very considerable, and occasionally extends as far as within the nostrils. Scrophula is also very often complicated with rachitis, or follows the latter affection; but, there is as little reason for supposing rickets to arise from scrophula, as this latter from rickets. In some instances, however, the complexion is dark, and the skin coarse; but, in these subjects, at least when young, the face is generally tumid, and the look unhealthy. (*Burns on Inflammation, Vol.* 2, *p.* 232.)

In many instances, the last joints of the fingers have been observed to be enlarged, and the belly is generally larger, than usual. (*Thomson, p.* 134.)

Mr. White seems, as I think, with some appearance of truth, to deny that grey, or blue eyes, light hair, and a fair complexion, ought to be considered as marks of a scrophulous predisposition; for, the majority of children in this country have light hair, and eyes, while young, which become darker as they advance in life. Now, as the majority of scrophulous patients are children, and young subjects, and as most children in this country have naturally the kind of hair and eyes above described, it seems inaccurate to lay any stress on persons affected with struma, or predisposed to this disease, having such appearances. (See *White on the Struma or Scrofula, p.* 38. *Edit.* 3.)

Dr. Thomson expressly declares, that some of the worst cases of scrophula, which he has seen, occurred in persons, whose complexion and hair were of a very dark colour. (*Lectures, p.* 134.) Another fact, which I think tends to impeach the accuracy of the common doctrine about complexion, is the circumstance of so many negroes being afflicted in this country with scrophula in its worst forms. Does not this fact indicate, at the same time, that it is climate, which is most powerfully concerned in the production of the disease; since the African black, in his own country, is nearly exempt from scrophula?

I believe the fact is now almost generally admitted, that females are rather more subject, than males, to scrophulous disease.

Struma, according to Mr. White, is as universal a complaint as it is ancient; but it prevails more extensively in temperate latitudes, than in very hot or very cold climates. It is also more frequent in some parts of Europe than others; and, in this country, it has been found to be most general in the counties of Suffolk, and Lancashire. At all periods, it seems to have been a very common complaint in this island. From history, we learn, that it was denominated the king's evil in the time of Edward the Confessor, who is supposed to have been the first that attempted to cure it by the royal touch. From a register kept in the royal chapel, we find that Charles the Second touched 92,107 persons, in a certain number of years; and this equally bigoted and useless practice was not discontinued till a recent period, when kings were found to be, as well as their poorest subjects, totally destitute of all supernatural power.

Scrophula is not communicable from one person to another; neither can it be conveyed into the system by inoculation. The opinion also, that scrophulous nurses may infect children, seems also to rest on little foundation. (See *White, p.* 56, 57.)

The parts, which are most frequently affected by scrophula, next to the lymphatic glands, are the spongy heads of the bones, and the joints. The form, which the disease assumes in the latter situations, is particularly described in the article *Joints.* The disorder of the spine, attended with a paralytic affection of the lower extremities, is, no doubt, very frequently of scrophulous origin. (See *Vertebræ.*) The spina bifida is a congenital disease, which is found to occur most frequently in children, whose parents are scrophulous. (*Thomson's Lectures, p.* 133.) The abscess, which forms in the cellular substance, between the peritoneum and psoas muscle, is often regarded as a strumous disease; and when the contents of the abscess are found to contain flakes of a curdy matter, somewhat resembling white-of-egg, a substance peculiar to scrophulous abscesses, no one can doubt, that the complaint is connected with this constitutional affection. (See *Lumbar Abscess.*) The chronic enlargement of the thyroid gland, is by many considered as scrophulous; and, the opinion seems to be strengthened by the fact, that patients, with this affliction, very often have, at the same time, other complaints, which are unequivocally strumous. It might also be noticed, that this enlargement of the thyroid gland most frequently commences at an early period of life, like other scrophulous diseases; and, like them, is benefited by the carbonate of soda. (See *Bronchocele.*) Scrophula also frequently makes its appearance in the form of imperfect suppurations, in various parts of the body; the contents of such abscesses being a curdy kind of matter, and the skin covering them, having an unhealthy red appearance, and a thickened doughy feel. The mesenteric glands are particularly often found universally diseased, and enlarged in scrophulous subjects; and, as all nutriment has to pass through these parts, before it can get into the circulation, we cannot be surprised at the many ill effects which must be produced on the system, when such glands are altered, and, no doubt, obstructed, in the way in which they frequently are. Scrophula also frequently makes its attack on the testicle. (See *Testicle, Diseases of.*) —The female breast likewise not unfrequently becomes affected with scrophulous tumours, and abscesses.

Dr. Thomson believes, that more or less local inflammation occurs in every form and stage of scrophulous diseases. He observes, that the swellings are very often from the first attended with a sensible increase of heat and redness, and that the pain, though seldom acute, is always present in a greater or less degree. Pressure on scrophulous swellings never fails to create pain; and the temperature of the skin covering them, is usually two or three degrees higher, than that of the contiguous parts. (*Lectures, &c. p.* 131.)

The scrophulous inflammation (says Mr. Burns) is marked by a soft swelling of the affected part, which, very frequently is one of the lymphatic glands. The covering, or coat of the gland, becomes slightly thickened, and its substance more porous and doughy. The swelling increases, and the doughy feel changes by degrees into that of elasticity, or fluctuation, and a firm, circumscribed, hardened margin, can be felt round the base of the tumour. The skin is slightly red. If, at this time, an incision, or puncture, be made, either no matter, or very little, is evacuated, the lips of the wound inflame and open, displaying a sloughy-looking substance within; and, betwixt this and the skin, a probe can often be introduced for some way all round. If, however, the disease should have advanced further, then there is very little elasticity in the tumour; it is quite soft, rather flaccid, and fluctuates freely; the skin becomes of a light purple colour, and small veins may be seen ramifying on its surface. Some time after these appearances, the skin becomes thinner at one particular part, and here it is also generally rendered of a darker colour. It afterwards bursts, and discharges a thin fluid, like whey, mixed with a curdy matter, or thick white flocculi. The redness of the skin still continues; but the aperture enlarges as the tumour subsides, and thus a scrophulous ulcer is produced. The margins of this kind of sore are generally smooth, obtuse, and overlap the ulcer; they are of a purple colour, and rather hard, and tumid. The surface of the sore is of a light red colour; the granulations are flabby and indistinct, and the aspect is of a peculiar kind, which, says Mr. Burns, cannot be described. The discharge is thin, slightly ropy, and copious, with curdy flakes. The pain is inconsiderable. When this ulcer has continued for some time, it either begins slowly to cicatrize, or, as more frequently happens, the discharge diminishes and becomes thicker. An elevated scab is next formed, of a dirty white, or yellowish colour. This continues on the part a good while; and when it falls off, leaves the place covered with a smooth purple cicatrix. Mr. Burns adds, that the preceding description corresponds to the mild scrophula, or the *struma mansueta*, of the old writers. This gentleman next remarks, that, occasionally, especially if a bone be diseased below the ulcer, the sore has a more fiery appearance, the surface is dark-coloured, the margins soft, elevated, and inflamed, and sometimes retorted. The discharge is watery, the pain very considerable, and the surrounding skin inflamed. This has been called the *struma maligna.* Such overacting scrophulous sores are most frequently met with over the smaller joints, particularly those of the toes. (*Burns.*) Sometimes a scrophulous abscess, after it has burst, forms a sinus; the mouth of which ulcerates, and assumes the specific scropulous appearance, while the track of the sinus still continues to emit a discharge. Mr. Burns also remarks, that scrophulous swellings are often disposed to subside in winter, and recur on the approach of summer; but, he adds, that this is not an invariable law. The glandular enlargements are very apt to become smaller, in a short time, in one place, while other glandular swellings originate with equal suddenness, somewhere in the vicinity of the former ones. Ulcers, also, very often heal, upon the appearance of the disease in other parts. (See *Dissertations on Inflammation, by John Burns, Vol.* 2, 1800.)

The glandular swellings, which occur in

syphilis, says Dr. Thomson, are of a more acute character, than those, which proceed from scrophula. They arise from the absorption of a specific poison; and they do not, like those of scrophula, admit of a spontaneous cure. Chronic swellings of the lymphatic absorbent glands occur also in carcinoma; but, these manifest little, or no disposition to suppuration; they succeed most frequently to carcinomatous indurations, or ulcers, existing in the neighbourhood of the glands affected; and they are accompanied in their progress and growth by a peculiar lancinating pain. (See *Thomson on Inflammation, p.* 135.)

With regard to the proximate cause of scrophula, medical men may be said to remain, even at the present day, in entire ignorance. Of the exciting causes, very little is also known. Mr. John Hunter remarks, that "in this country, the tendency to scrophula arises from the climate, which is in many a predisposing cause, and only requires some derangement to become an immediate cause, and produce the whole disease." (*Treatise on the Venereal Disease, p.* 26.) In the same part of the work, this celebrated writer takes notice of slight fevers, colds, small-pox, and measles, exciting scrophulous diseases. He observes, also, that, in particular countries, and in young people, there will sometimes be a predisposition to scrophula: and that, in such subjects, buboes will more readily become scrophulous. (*P.* 27.) In short, it was one of Mr. Hunter's opinions, and probably a most correct one, that the venereal disease is capable of calling into action such susceptibilities as are remarkably strong, and peculiar to certain constitutions and countries; and that, as scrophula is predominant in this country, some effects of other diseases may partake of a scrophulous nature. (*P.* 96.) Mr. Hunter, speaking of venereal buboes, mentions his having long suspected a mixed case, and adds, "I am now certain that such exists. I have seen cases, where the venereal matter, like a cold, or fever, has only irritated the glands to disease, producing in them scrophula, to which they were predisposed. In such cases, the swellings commonly arise slowly, give but little pain, and seem to be rather hastened in their progress, if mercury is given to destroy the venereal disposition. Some come to suppuration while under this resolving course; and others, which probably had a venereal taint at first, become so indolent, that mercury has no effect upon them; and, in the end, they get well of themselves, or by other means." (*P.* 269.) For such buboes, Mr. Hunter used to recommend sea-bathing; and, in case of suppuration, poultices made with sea-water.

In the words of a well-informed Professor, scrophula readily forms an alliance with almost every morbid affection, occurring either from external injury, or from internal disease; it modifies the appearance of other diseases, and seems to convert them gradually into its own nature. Indeed, there are few of the local inflammatory affections, which occur in this country, in which the symptoms and effects of these affections, and the operation of the food and remedies employed for their cure, are not more or less modified by the degree of scrophulous diathesis, which prevails in the constitution of those who are affected by them. The scrophulous diathesis, wherever it exists, usually gives more or less of a chronic character to local inflammatory affections.—(*Thomson's Lectures, p.* 131.)

It would be tedious and useless to expatiate on the many absurd notions, which have been entertained, concerning the proximate cause of struma. All that we need add in this work, is, that certain constitutions probably have a congenital disposition to the disease; that such disposition may probably be increased, or diminished, by the operation of climate, mode of life, age, &c.; and that irritations of a thousand kinds may excite the disease into action, when the system is predisposed to it, by inexplicable causes. That climate has great influence, cannot be doubted, when we reflect, that the inhabitants of certain countries, in which the temperature is invariably warm, never suffer from scrophula. There can also be no doubt that, with age, the disposition to scrophula diminishes; for, children, much afflicted while young, frequently get quite well when they approach the adult state; and, if a person has remained perfectly free from any mark of a scrophulous constitution, till the age of twenty-five, he may be considered as nearly out of all danger of the disease.

### TREATMENT OF SCROPHULA.

"For the cure of scrophula, (says the celebrated Cullen,) we have not yet learned any practice that is certainly, or even generally successful. The remedy which seems to be the most successful, and which our practitioners especially trust to, or employ, is the use of mineral waters. But, (adds this eminent physician,) in very many instances of the use of these waters, I have not been well satisfied, that they had shortened the duration of the disease more than had often happened when no such remedy had been employed. With regard to the choice of the mineral waters most fit for the purpose, (says Cullen,) I cannot, with any confidence, give an opinion. Almost all kinds of mineral waters, whether chalybeate, sulphureous, or saline, have been employed for the cure of scrophula, and, seemingly, with equal success and reputation; a circumstance, which leads me to think, that, if they are ever successful, it is the elementary water that is the chief part of the remedy. Of late, sea-water has been especially recommended, and employed; but, after numerous trials, I cannot yet discover its superior efficacy." (*First Lines of Physic, Vol.* 4.) On the subject of mineral waters, Dr. Thomson very properly remarks, that they are now usually employed as purgative and tonic remedies, and not as specifics. In employing them it is often difficult to distinguish between the effects, which they in reality produce, and those which are to be attributed to the slow operation of time, the season of the year, change of situation, alteration in the mode of life, or exercise in the open air. (*Lectures on Inflammation, &c. p.* 195.)

Dr. Fordyce extolled bark for its efficacy in scrophulous diseases; he endeavours to prove, that, in cases of tumefied glands, attended with a feeble habit, and a weak circulation, it is a most efficacious medicine, and acts as a resolvent and discutient. He also brings forward a case, in support of bark being a means of cure for the ophthalmia strumosa. (See *Med. Obs. and Inq. Vol.* 1. *p.* 184.) Dr. Fothergill, in the same work, p. 303, writes in favour of the good effects of bark in similar cases; the latter sometimes gave, at the same time, small doses of calomel.

Dr. Cullen considered the efficacy of bark in scrophula as very dubious and trivial. (*First Lines, &c. Vol.* 4.)

Mr. Burns remarks, that bark has been frequently found useful in the cure of scrophulous inflammation, but more often of ulceration, than tumefaction of the glands. But, adds this gentleman, it does not appear to possess, by any means, that certain power of curing scrophulous affections, which is attributed to it by Dr. Fothergill and several other authors. He observes, that we are not to suppose, that it will infallibly cure scrophulous inflammation, or ulceration of parts, which, even when affected with simple inflammation, are very difficult of cure. If it be difficult to cure a simple inflammation, or ulceration, of a tendon, cartilage, or bone, we must not be disappointed if even a specific remedy for scrophula (were such ever discovered) should prove ineffectual in procuring a speedy restoration to health. Mr. Burns contends, that bark is often ineffectual, because improperly administered. Given in small quantities, once or twice a day, it may prove a stomachic, and increase, like other tonic bitters, the power of the stomach, or the functions dependent on it; but, in order to obtain the benefits of the specific action of bark, he maintains, that it should be given in large quantities, for several weeks, with a good diet, air, and proper exercise.—(*Dissertations on Inflammation, Vol.* 2. *p.* 371.) Dr. Thomson does not believe, that bark, or iron, has any specific virtue in curing scrophula; but, he admits, that either of these medicines may sometimes prove useful in improving the tone of the digestive organs, when given after, or occasionally along with, a course of purgative mineral waters. (*Lectures, p.* 197.)

As far as I can judge, Mr. White has, with much reason, recommended paying attention to such circumstances as may have effect in preventing the disease, viz. air, cleanliness, exercise, and diet. He mentions cold-bathing among the preventives of struma, and speaks of sea-bathing as being the best. He advises attention, also to be paid to the manner of clothing children, keeping them more covered in winter, than summer. Mr. White thought, that allowing children to sleep a great deal was prejudicial; but, this seems to me only conjecture.

In noticing the treatment of the disease, Mr. White states, that "the general idea of the struma is, that it is a disease of debility; and therefore, the great object is, to invigorate the habit by every possible means; the chief of which are tonic medicines, and sea-bathing. Some are of opinion, that in the case of young patients, this should be continued, during the summer months, every year, to the age of fourteen or sixteen. Many recommend it, not only in the summer, but throughout the year: whilst others are for administering alteratives, principally the alkaline salts, with or without antimonials, and the different tonics, during the winter; and the sea-water, and sea-bathing, or cold-bathing, during the summer, for a continuance of two or three years from the commencement of the disease; with this general observation, that they will outgrow the complaint." Mr. White adds, that the chief external means are fomentations of sea-water, and cataplasms, made with the same. With respect to regimen, some recommend a milk and vegetable diet; others animal food, and fermented liquors.

Mr. White maintains, that the preceding plans of treatment are not, in general, efficacious, though in some instances, they may prove useful. "In early affections of the lymphatic glands, (says this gentleman,) and from the want of a pure air, and proper exercise, where children are delicate and irritable, a change of situation to the sea-side, together with bathing, when they have acquired some strength, must be exceedingly proper; and, in gross plethoric subjects, who have diseased lymphatics, from improper feeding, and want of necessary exercise, a journey to the sea-coast may be very useful, particularly if the salt-water is drank often, and in a sufficient quantity to become purgative. This, with the novelty of their situation, which may naturally produce an increase of exercise, might answer every expectation; but, these are the kind of cases that, with a very little attention, are easily cured." (*White on the Struma, Edit.* 3. *p.* 104.)

The conclusion to which Mr. White's remarks upon this part of the subject tend, is, that sea-bathing only deserves praise, as a preventive, and in the early stages of the disease. He particularly condemns cold-bathing, for poor, weakly, debilitated children, whose thin visage, enlarged belly, and frequent tickling cough, sufficiently indicate diseased viscera; such do not recover their natural warmth, after cold-bathing, for hours, and their subsequent head-ach, livid lips, and pale countenance, are sufficient marks of its impropriety. (*P.* 107.)

Dr. Cullen entertained a very favourable opinion of cold-bathing, since he affirms, that he had seen scrophulous diseases more benefited by it, than any other remedy. (*First Lines of Physic, Vol.* 4.)

"Cold-bathing, especially cold sea-bathing (says Mr. Russell) is a remedy universally employed in scrophula, and I believe with great advantage in many cases; for it not only appears to improve the patient's general health and strength, but likewise to promote the detumescence of enlarged glands, and the resolution of indolent swellings in the joints, even after they have attained a considerable size, and have existed for a great length of time. But, in order that cold-bathing may be practised with safety, and advantage, the constitution must have vigour to sustain the shock of immersion without inconvenience. If the immersion be succeeded by a general glow over the surface of the body, and the patient feels cheerful, and has a keen appetite, we may conclude that he agrees with the cold bath; but if he shivers on coming out of the water, continues chill, and becomes drowsy, we may be assured that the practice of cold-bathing does no good, and had better be omitted.

"In estimating the comparative merit of cold-bathing and warm-bathing, in the cure of scrophulous complaints, my own experience, together with the result of different conversations on the subject with some of the most judicious practitioners of my acquaintance, would lead me to bestow much more commendation on the effects of warm-bathing. I should not even be inclined to circumscribe the practice to cases of emaciation and debility, since from observation, I am fully satisfied with regard to the beneficial effects of the warm bath to patients of plethoric constitutions, who were much affected with swelled scrophulous glands. Several of those instances occurred in young women, about the prime of life, who were in all respects healthy and vigorous, abating the swellings of the glands, and those symptoms of distress which were connected with fulness of blood.

"The sensation of the warm bath is exceedingly grateful to most patients, and the practice is universally safe. It may be employed at all seasons of the year, and in all weather, without danger or inconvenience; the risk of suffering from exposure to cold, immediately after immersion in the warm bath, having been much magnified by prejudice. There is not even any good reason to believe in the existence of such a risk. The precautions, however, which are employed to avert it, are perfectly innocent; and provided they do not impose any unnecessary and incommoding restraints upon the practice, may be encouraged, so far as to relieve the patient's mind from uneasiness and groundless apprehensions.

"It requires many weeks, and sometimes several months, to ascertain the full effects of warm-bathing in relieving scrophulous complaints; but, as the practice is not attended with any inconvenience, nor followed by any bad consequence, there can be no reason to intermit the course, till the trial is completely satisfactory: and I am convinced, that the practice of warm-bathing, in cases of scrophula, will be more universally adopted, after the knowledge of its beneficial effects is more widely diffused." (See *Russell's Treatise on Scrophula.*)

Nothing can be more satisfactory (says Professor Thomson), than the evidence, which is on record of the efficacy of the muriate of soda, as it exists in sea-water. In reading this, one only wonders how so efficacious a remedy should ever have fallen into neglect. (*P.* 196.) In a subsequent passage, however, the same gentleman evinces only a limited confidence in this means of relief. "Local sea-bathing, both cold and warm, has often appeared to be of use in procuring the resolution of scrophulous swellings. The temperature of the bath must always be varied according to circumstances, according to the season of the year, the strength and habits of the patient, and the particular effect, which the bath seems to produce. It is at all times difficult to distinguish between the effects immediately arising from the application of salt water to the body, and those which arise from the increased warmth of temperature in the bathing seasons of the year; from the exercise, which patients going to sea-bathing generally take in the open air; from the change of situation and amusements; and, among the poorer classes, from the more nourishing diet and exemption from labour, in which they are usually permitted to indulge, during their residence at sea-bathing quarters. It is not improbable, that those living on the sea-coast, who become affected with scrophula, would, for similar reasons, derive equal benefit by going from the sea-coast to reside for a time in the interior of the country." (See *Thomson's Lectures, &c. p.* 203—204.)

With regard to electricity, Mr. White thinks it useful, when from length of time the enlarged glands have acquired a degree of hardness and insensibility.

Mr. White, after enjoining attention to air, exercise, and diet, as promotive of a recovery, as well as preventive of the disease, proceeds to explain his own practice. The internal cases, which properly belong to the physician, we shall dismiss from consideration. The first external symptoms, such as swellings of the lips, side of the face, and of glands under the chin, and round the neck; also other symptoms, usually considered as strumous, viz. roughness of the skin, eruptions on the back of the hand, and different parts of the body, redness, and swelling of the eyelids, and eyes; are accompanied, according to Mr. White's conceptions, with an inflammatory diathesis, though seldom such a one, as to require bleeding. Calomel is the medicine, which this gentleman recommends for the removal of the foregoing complaints. It is not to be given in such quantities, as to render it a powerful evacuant, either by the intestines, or any other way; but, in small doses, at bedtime. Thus, says Mr. White, "it remains longer in the intestinal canal, a greater quantity is taken into the habit, and the patient is less susceptible of cold, than when taken in the day-time. The first, and, perhaps, the second dose may prove purgative, which is, in general, a salutary effect; but, afterwards, the same quantity will seldom do more, than is sufficient to keep the body open; and should it fail of answering that purpose, I have usually recommended some gentle purgative, every third or fourth morning, according to circumstances. If there should be a prevailing acidity, a few grains of the sal sodæ, magnesia, or some testaceous powder, may be added to the medicine. By this simple method (continues Mr. White) most of the symptoms before-mentioned, will, in a short time, disappear; but if the tumours should continue hard, and retain their figure, without dividing into smaller ones, we may derive some benefit from external applications, particularly the steam of warm water. I have used a variety of medicinal herbs with success; but am inclined to believe, that the advantage was principally derived from the warm water, &c. At other times, I have stimulated the part affected by electricity, insulating the patient, and drawing sparks from the tumour, until a slight degree of inflammation was excited. After the application of the steam, or the use of the electrical machine, I have sometimes rubbed a little of the unguentum mercuriale into the tumour, and neighbouring parts, or applied the emplastrum saponaceum, or mercuriale cum ammoniaco, over the swelling, or a liniment with camphor, ol. olivarum, and sp. terebinth." Mr. White adds, that in such cases, if the tumours should suppurate, and burst, the parts will, in most instances, heal without much trouble. For eruptions on the head, he recommends applying the ung. saturn. album camphoratum, or the cerat. alb. cum hydrarg. præcip. alb. For the roughness of the skin, which is generally followed by eruptions, he also advises the aqua-vegeto-mineralis, aqua calcis, solutions of sal. tartar. or of the hydrarg. mur. as outward applications. "This last (says Mr. White) will seldom fail to check the progress of the complaint, and dry the sores; and in the quantity of ten or twelve grains, to a quart of warm water, the use of it will not be productive of any pain. If the eruption should ulcerate, and require any unctuous application, to prevent the adhesion of the linen, the ointment before-mentioned may be applied; the best remedy will be warm-bathing, and when practicable, the sea-water claims a preference." (*P.* 114.) The author next mentions his having occasionally recommended the vinum antimoniale, tartarum emeticum, decoctum Lusitanicum, decoctum lignorum, or sarsaparillæ; and that he sometimes found advantage derived from artificial drains. We need not detail this gentleman's mode of treating affections of the eyelids, as the reader may find all the necessary instruction, concerning scrophulous diseases of the eye and eyelids, by referring to *Ophthalmy* and *Psorophthalmy.*

For the cure of indurations in the breast, remaining after mammary abscesses, Mr. White speaks very highly of the effects of the steam of warm water; and cautions us against indiscriminately employing calomel, which will often affect the mother little, but the child violently. Mr. White mentions his employing a small tin machine, large enough to hold a pint and a half, or two pints of boiling water. From the top proceeded a narrow tube, ten, or twelve inches long, through which the steam passed. Near its end, which was moveable and curved, was a joint, for the greater convenience of directing the steam to the diseased parts. The water was easily kept boiling, by means of a lamp under the machine. Mr. White says, that the steam should be employed twice, or thrice a day, and a piece of flannel, or skin, afterwards applied. The body should also be kept open. In obstinate, neglected cases, mercurial preparations, according to Mr. White, must likewise be given, and, if they affect the child much, suckling should be suspended. (*P.* 117, 118.)

Mr. White speaks largely of the treatment of cases, in which the mesenteric glands are diseased; but, this subject strictly belongs to the physician. When, in these instances, the glands of the neck, or other parts of the body, tend to a state of suppuration, it is very slowly, the skin appearing uniformly thin, and of a deep red colour, and the tumour seeming flaccid. In such cases, Mr. White recommends the use of the lancet or caustic; for, if no artificial opening is made, it will be a long time, before the skin gives way; and, when it does, the aperture will not only be very small, but often unfavourable in its situation. Mr. White adds, that the contents will often be more like mucus, than pus, or like a mixture of both; and the discharge will continue for a great length of time, if no remedy is applied. This gentleman mentions his having found a solution of gum myrrhæ in aqua calcis, used as a lotion, and the ceratum saponaceum, or some similar outward application, the best method of treating this symptom.

We need not describe Mr. White's practice in the treatment of scrophulous joints, as the subject is fully considered in the article *Joints.* It appears, however, that he confirms the efficacy of stimulating applications, and pressure with bandages, when the fingers and toes are affected with strumous disease. (*P.* 143.)

Dr. Crawford, M. Pinel, and others, have tried the muriated barytes, as a remedy, in scrophulous cases. (*Med. Communications, Vol.* 2. *Nosographie Philosophique, Vol.* 2. *p.* 238.) It had the recommendation of the celebrated Hufeland. Mr. Burns says, that the muriate of barytes has no effect on diseased glands; but, that it is occasionally serviceable in scrophulous ulceration, though, he adds, that it deserves little dependence. (*Dissert. on Inflamm. Vol.* 2. *p.* 372.) This gentleman recommends the following formula: ℞. *Terræ Ponder. Salit. Chryst. gr.* x. *Aq. Font. Aq. Cassiæ, utriusque,* ℥iij. *Syrup. Aurent.* ℥ij. Half an ounce of this may be given at first, twice or three times a day, and gradually increased to such quantity, as the stomach can bear without sickness. At present, few practitioners have any faith in the antiscrophulous virtues of the muriate of barytes; and, as Dr. Thomson remarks, it has had a much shorter-lived reputation, than sea-water, or its successor the muriate of lime. (See *Lectures on Inflammation, p.* 196.)

Fourcroy proposed trying the muriate of lime; but, its efficacy is very doubtful, and inconsiderable. "Professor Thomson (says Mr. Russell) has favoured me with the following observations on the effects of muriate of lime. He employed muriate of lime in various cases of scrophula, without having derived benefit from it in a single instance. Some patients, indeed, he admits, got well, while under a course of muriate of lime; but then he had no reason to ascribe the cure to the effect of the medicine. In other cases, on the contrary, the muriate of lime produced severe sickness and oppression at the stomach, and the patients got daily worse, till the muriate of lime was intermitted, and other medicines employed. The relief, experienced from the intermission of the muriate of lime, left no doubt, with regard to the injurious effects, which the use of it had produced; and from extensive experience and accurate observation on the subject, Professor Thomson is satisfied, that muriate of lime is attended with prejudicial effects in many cases of scrophula." (See *Russell's Treatise on Scrophula.*) Since the publication of the last edition of this dictionary, I have seen the muriate of lime given in several cases of scrophula; but, without any beneficial effect on the disease. How long the muriate of lime will be permitted to enjoy its present fame, Dr. Thomson will not venture to say; but from what he has seen of its use, he imagines, its reputation will only last, till some other new remedy is proposed by those, who are still sanguine in their hopes of discovering a specific for scrophula. (*Lectures, &c. p.* 196.) Iron, given either alone, or joined with the fixed, or volatile alkali, also deserves very little confidence. Burnt sponge, millipedes, and sulphate of potassa, have all been extensively tried: the first of these is, in my opinion, sometimes useful in diminishing enlarged scrophulous glands: that it has this effect on bronchoceles, is indisputable.

The Marischal de Rougeres employed a remedy, composed of iron filings, muriate of ammonia, kali præparatum, &c. (*Journ. de Med. tom.* 40. *p.* 219.)

Several narcotics have been tried, such as opium, hyoscyamus, the solanum dulcamara, &c.; but, though their virtues against scrophula have been sometimes cried up very highly, the moderns have lost all faith in them. The attention of the public to the effects of cicuta, in cases of cancer and scrophula, was first particularly excited by the accounts of its virtues published by Baron Stork.

Fothergill also praises cicuta, and, perhaps, it is as good an internal medicine as can be tried; but, it is far from being generally efficacious. It is highly deserving of recommendation for irritable scrophulous ulcers. There is now not the least doubt, however, that the statements of Baron Stork are greatly exaggerated. He considered cicuta indicated, whenever obstructions and tumours existed; and, under this treatment, he says that he found the swellings melt away, like ice. What is extraordinary, every sort of tumour yielded to cicuta. But, (as Dr. Thomson judiciously remarks) universal success is always one of the most suspicious circumstances, which can be mentioned in the history of the effects produced by any new remedy. (*Lectures, &c. p.* 199.) Dr. Cullen frequently employed hemlock, and sometimes found it useful in discussing obstinate swellings; but, he says, it also frequently disappointed him, and he never saw it dispose scrophulous ulcers to heal.

With regard to mercury, we have already noticed, that calomel was much employed by Mr. White. Some have exhibited the sublimate; others the acetite of mercury. All these preparations have been at times conjoined with cicuta, antimony, &c. Calomel is, perhaps, the best mercurial preparation in scrophulous cases; but, mercury, given internally with any view of exciting a salivation, is justly deemed hurtful by all the best practitioners. As an alterative, and an occasional purgative, it is undoubtedly a good medicine for strumous patients. Mercury was much disapproved of by the celebrated Cullen, as a medicine for scrophula. As a distinguished Professor observes: "From the great apparent similarity of the symptoms, progress, and seats of scrophula, to those of syphilis, and from the well known effects of mercury in curing syphilis, it need not seem strange, that medical men should have been a little obstinate in their attempts to obtain benefit from the use of mercury in scrophula. These expectations are in general abandoned, and mercury is now given for the cure of scrophula as a purgative only. A long continued, or improperly administered course of this medicine, has often been known to aggravate all the symptoms of scrophula; and, in many instances, to excite these symptoms in persons, in whom they did not previously exist." (See *Thomson's Lectures on Inflammation, p.* 194—195.)

Mr. Burns thinks the nitrous acid has some effect in promoting the suppuration of scrophulous glands, and tumours, and disposing ulcers to heal. He says, two, or three drams may be given every day, for a fortnight; but, if in this time, it should do no good, its employment ought to be discontinued. The mineral acids, diluted with water, (says Professor Thomson), are often used with views similar to those, which guide us in the employment of tonic remedies. Their medicinal powers appear to be nearly the same; but, the nitric acid has of late been preferred, particularly in the scrophulous affections, which are sometimes induced by the action of mercury. (*Lectures, &c. p.* 197.)

The pills containing carbonate of soda, (see *Pilulæ,*) and the different soda waters, sold at the shops, have repute, for their good effects on scrophulous constitutions, and diseases. A spirituous infusion of gentian, into six ounces of which are put thirty-six grains of the carbonate of soda, or the same quantity of the carbonate of ammonia, is a medicine highly spoken of by Richerand for scrophulous cases. (*Nosographie Chir. Tom.* 1, *p.* 184, *Edit.* 4.)

Eight, or ten drops of the hepatized ammonia, given thrice a day, are useful, according to Mr. Burns, in irritable strumous ulcers. The breathing of oxygen gas has been proposed; but, of this plan I can say nothing myself.

The sentiments of Dr. Cullen are decidedly against antimony. As a modern writer observes, no great dependence seems ever to have been placed in the use of diaphoretic medicines for the cure of scrophula. The different preparations of antimony, indeed, have been occasionally administered; but, chiefly in cutaneous affections, supposed to be of a scrophulous nature. Guaiacum, sarsaparilla, sassafras, and mezereon, singly, and in combination, have all been supposed to be useful in the cure of scrophula; but they are now seldom given with this view, except in cases of scrophula combined with syphilis, or excited by the too free and injudicious use of mercury. (*Thomson's Lectures, &c. p.* 199.)

The local treatment, preferred by Mr. White, has been already described. I have only a few words to add, concerning this part of the subject. Dr. Cullen states, that, in his practice, he had very little success in discussing incipient scrophulous tumours by topical applications; and that a solution of the saccharum saturni, though sometimes useful, more frequently failed. Dr. Cullen found the aqua ammoniæ acet. not more successful. "Fomentations of every kind (says he) have been frequently found to do harm; and poultices seem only to hurry on a suppuration. I am doubtful, if this last be ever practised with advantage; for scrophulous tumours sometimes spontaneously disappear, but never after any degree of inflammation has come upon them; and, therefore, poultices, which commonly induce inflammation, prevent that discussion of tumours, which might otherwise have happened." Even when scrophulous tumours have advanced towards suppuration, Dr. Cullen thought, that hastening the spontaneous opening, or making one with a lancet, was hurtful.

With respect to ulcers, Dr. Cullen remarks, that escharotic preparations, of either mercury, or copper, have been sometimes useful in bringing on a proper suppuration, and thereby disposing the ulcers to heal; but, they have seldom succeeded, and more commonly, they have caused the ulcer to spread more. The escharotic, from which Cullen saw most benefit result, is burnt alum, mixed with some mild ointment. But, this celebrated writer gives the preference to keeping the sores continually covered with linen wet with cold water in the day-time, and some ointment, or plaster at night. Cullen says, that he usually found sea-water too irritating, and no mineral water better, than common water. (*First Lines of the Pract. of Physic, Vol.* 4.)

Formerly the extirpation of scrophulous tumours was advised; but, this method is now considered as being, for the most part, injudicious, and unnecessary, with the exception of diseased joints, and a few other parts, which frequently require being amputated, for the sake of saving the patient's life. Certainly, no particular danger (generally speaking) would attend cutting out scrophulous glands, and tumours; the objections to the plan are founded on the pain of the operation; on the number of such glands frequently diseased; on their often subsiding, either spontaneously, or by surgical treatment; on the operation doing no good to the general affection of the system, &c. When, however, a scrophulous testicle, breast, or joint, seriously impairs the health, and endangers life, the very existence of the patient demands the immediate removal of the diseased part. Wiseman relates, that he was in the habit of cutting out scrophulous glands, and tumours, with great success; but, for reasons, already alleged, most of the moderns think such operations in general at least unnecesssary.

Caustics have been employed for the same purpose, instead of the knife; but, as they effect the object in view less certainly, more painfully and tediously, and cause extensive ulcers, they are disused by all the best surgeons of the present day.

Some authors have advised making issues, and keeping them open, in order to prevent any ill effects from healing scrophulous ulcers. Issues are certainly quite unnecessary for any purpose of this kind; but they are eminently useful as a part of the local treatment of scrophulous joints and abscesses, as we have more particularly explained in the articles *Joints, Lumbar Abscess,* and *Vertebræ.*

Mr. Burns notices, that issues have hitherto been chiefly used in diseases of the bones and joints; but, he adds, that it is reasonable to suppose, that they ought likewise to be useful in the cure of enlargements of the glands, and other scrophulous tumours, if inserted in the immediate vicinity of the part. The only objection to their use is the scar, which they leave, and which, in certain situations, one would particularly wish to avoid. When the tumour is thickly covered with the integuments, the issue may be made directly over it, and kept open with the savine ointment. In other cases, a small pea issue, or seton, may be inserted by the side of the tumour. This method would be objectionable, for scrophulous glands in the neck, in consequence of the scar; but, it might be employed, when the mamma is diseased. (*Dissertations on Inflammation, Vol.* 2.)

Preparations of lead; cloths dipped in cold water, sea-water, or weak vegetable acids; æther; sea-salt mixed with bile; the linimentum camphoræ; a mixture of æther and the linimentum opiatum; and hemlock poultices; form a long list of applications, which have been employed for scrophulous tumours.

According to Mr. Burns, moderate pressure, by means of adhesive plaster, conjoined with the application of cold water, is one of the best plans of treating mild scrophulous ulcers, when their situation admits of it. In other cases, he recommends applying a powder, five parts of which consist of cerussa acetata, and the sixth of burnt alum. A piece of dry lint is next to be applied, and a compress, with such pressure as can be used. Benefit occasionally results from dipping the compress in cold water.

The ceratum è lapid. calamin. is a good common dressing, when it is wished not to interfere much with the progress of the ulcer. The ung. hydrarg. nitrat. rub. and the ung. hydrarg. nitrat. are the best stimulating ointments. Poultices of bread and sea-water; solutions of alum, cuprum vitriolatum, and the hydrarg. mur.; solutions of the nitrates of copper, bismuth, and silver; the recent leaves of the wood-sorrel bruised; lint dipped in lemon juice, or vinegar and water; are among the applications to common scrophulous ulcers.

For irritable sores, diluted, hepatized ammonia; ointments containing opium; carrot and hemlock poultices; a solution of opium; and carbonic acid gas; are commonly recommended.

The following are Mr. Russell's sentiments respecting the treatment of scrophulous ulcers: "Scrophulous complaints in general do not agree well with stimulant applications. In the treatment of scrophulous ulcers, under the ordinary circumstances of complaint, the simplest and mildest dressings answer best. When the patients are using a course of sea-bathing, it is usual to wash the sores with sea-water, over and above the momentary application of the sea-water during the immersion of the whole body. Cold spring water is likewise a favourite application with many practitioners; and, from much observation, it appears that the operation of cold is well suited to counteract the state of inflammation, which accompanies scrophulous sores. Preparations of lead are, upon the whole, very convenient and useful applications, provided the solutions be used in a state of sufficient dilution to prevent irritation. Liquid applications are applied by means of wet linen, which is renewed whenever it dries, so that the surface of the sore may be kept constantly moist, when under this course of management. Upon the same principle, simple ointment and Goulard's cerate, furnish the best dressing in ordinary cases.

"Scrophulous congestions, of a solid nature, in the more external parts of the body, are little adapted to the practice of local bleeding, unless they be attended with symptoms of inflammation; but as some degree of inflammation is, in general, present during the incipient stage, it may be prudent to employ local bleeding in moderation at the commencement of the attack, although there may be no indication to persist in the practice, after the complaint has advanced farther in its progress. If, however, these congestions are more of an indolent nature, unaccompanied with heat or pain, there is no benefit to be expected from the local detraction of blood; warm fomentations, together with the use of stimulants, and a repetition of blisters, are the most serviceable class of remedies: such cases, too, are the best adapted to the use of friction as a discutient. Friction, indeed, has long been employed for this purpose; but, of late years, it has been introduced to an extent, and with an effect, far beyond the experience of all former practice. As yet, it has been circumscribed to the practice of a very few individuals, with whom it is said to have performed very great cures; and if, upon the test of more extensive experience, it is found to answer its present high character, I shall consider the use of repeated frictions to be one of the most valuable improvements which has been introduced into practice in modern times. The safety and simplicity of the practice recommend it very strongly to favour, though I am afraid they are the very circumstances which retard its adoption by the public in general. I only regret that I do not feel myself entitled to give a decided opinion upon the subject from my own experience, though I have known some instances of successful cures; but the reports of success are so numerous and so well supported, that I am inclined to think very favourably of the practice.

"There is no substance interposed between the surface of the swelling and the hand of the person who administers the friction, excepting a little flour, to prevent the abrasion of the skin. The friction is applied regularly two or three hours every day, with great celerity, the hand being made to move to and fro one hundred and twenty times in a minute, and the course may require to be continued without interruption, for some months." (See *Russell on Scrophula.*)

I shall not enlarge upon this endless subject, which still stands in need of elucidation, as much as any disease, that can be instanced. The scrophulous affections of the joints are explained in *Joints. Bronchocele; Lumbar Abscess; Spina bifida;* and *Vertebræ*, are other articles, containing matter connected with the preceding observations.

The reader may consult *Wiseman's Chirurgical Treatises. Heister's Surgery. Cullen's First Lines of the Practice of Physic, Vol.* 4. *Ferne on the King's Evil. Cheyne on the King's Evil. B. Bell's Surgery, Vol.* 5. *B. Bell on Ulcers. Kirkland's Medical Surgery, Vol.* 2. *White on the Struma, Edit.* 3, 1794. *A. G. Kortum's Comment. de Vitio Scrophuloso, in* 2 *Vol.* 4*to. Lemgoviæ,* 1789. *London Med. Obs. and Inq. Vol.* 1. *Encyclopédie Méthodique, Art. Ecrouëlles. Dissertations on Inflammation, by John Burns, Vol.* 2. *Crowther's Obs. on the Disease of the Joints, commonly called White Swelling; with remarks on Caries, Necrosis, and Scrophulous Abscesses, &c. Edit.* 2, 1808. *A Treatise on Scrofula, by James Russell, Edinburgh,* 1808. *Lectures on Inflammation, by John Thomson, M. D. p.* 130, *et seq. p.* 155—191, *&c. Edinb.* 1813. *This work contains as good, and as rational an account of the subject, as any book, which I have examined. Richerand's Nosographie Chirurgicale, Tom.* 1, *p.* 165, *et seq. Edit.* 4. *Delpech, Précis Elémentaire des Maladies reputées Chirurgicales, Tom.* 3, *p.* 617, *&c. Paris,* 1816. *Lassus, Pathologie Chirurgicale, Tom.* 2, *p.* 383, *&c. Edit.* 1809. *Callisen, Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 113, *Hafniæ,* 1800. *Boyer, Traité des Maladies Chirurgicales, Tom.* 2, *p.* 414, *&c. Paris,* 1814.

**SCROTOCE'LE.** (from *scrotum*, and κηλη, a tumour.) A rupture, or hernia in the scrotum.

**SCROTUM, CANCER OF,** (*Chimney-sweeper's Cancer. The soot-wart.*) Mr. Pott gives the following account of this peculiar disorder.

"It is a disease, which always makes its first attack on, and its first appearance in the inferior part of the scrotum; where it produces a superficial, painful, ragged, ill-looking sore, with hard and rising edges: the trade call it the soot-wart. I never saw it under the age of puberty, which is, I suppose, one reason why it is generally taken, both by patient and surgeon, for venereal, and being treated with mercurials, is thereby soon and much exasperated: in no great length of time, it pervades the skin, dartos, and membranes of the scrotum, and seizes the testicle, which it enlarges, hardens, and renders truly and thoroughly distempered; from whence it makes its way up the spermatic process into the abdomen, most frequently indurating and spoiling the inguinal glands: when arrived within the abdomen, it affects some of the viscera, and then very soon becomes painfully destructive.

"The fate of these people seems singularly hard: in their early infancy, they are most frequently treated with great brutality, and almost starved with cold and hunger; they are thrust up narrow, and sometimes hot chimneys, where they are bruised, burned, and almost suffocated; and when they get to puberty, become peculiarly liable to a most noisome, painful, and fatal disease.

"Of this last circumstance there is not the least doubt, though perhaps it may not have been sufficiently attended to, to make it generally known. Other people have cancers of the same parts; and so have others beside lead-workers, the Poictou colic, and the consequent paralysis: but it is nevertheless a disease to which they are peculiarly liable; and so are chimney-sweepers to the cancer of the scrotum and testicles.

"If there be any chance of putting a stop to, or preventing this mischief, it must be by the immediate removal of the part affected; I mean that part of the scrotum where the sore is; for, if it be suffered to remain until the virus has seized the testicle, it is generally too late even for castration. I have many times made the experiment; but though the sores, after such operation, have, in some instances, healed kindly, and the patients have gone from the hospital seemingly well, yet, in the space of a few months, it has generally happened, that they have returned either with the same disease in the other testicle, or in the glands of the groin, or with such wan complexions, such pale leaden countenances, such a total loss of strength, and such frequent and acute internal pains, as have sufficiently proved a diseased state of some of the viscera, and which have soon been followed by a painful death.

"If extirpation ever bids fair for the cure of a cancer, it seems to be in this case; but then the operation should be immediate, and before the habit is tainted. The disease, in these people, seems to derive its origin from a lodgment of soot in the rugæ of the scrotum, and at first not to be a disease of the habit. In other cases of a cancerous nature, in which the habit is too frequently concerned, we have not often so fair a prospect of success by the removal of the distempered part; and are obliged to be content with means, which I wish I could say were truly palliative: but here the subjects are young, in general in good health, at least at first; the disease brought on them by their occupation, and in all probability local; which last circumstance may, I think, be fairly presumed from its always seizing the same part: all this makes it (at first) a very different case from a cancer, which appears in an elderly man, whose fluids are become acrimonious from time, as well as other causes; or from the same kind of complaint in women who have ceased to menstruate. But be all this as it may, the scrotum is no vital organ, nor can the loss of a part of it ever be attended with any, the smallest degree of inconvenience; and if a life can be preserved by the removal of all that portion that is distempered, it will be a very good and easy composition; for when the disease has got head, it is rapid in its progress, painful in all its attacks, and most certainly destructive in its event." (*Pott's Works, Vol.* 3.)

SCROTUM, *Sarcomatous Thickening and Enlargement of.* It is the particular opinion of M. Larrey, that this is the case, which properly merits the appellation of sarcocele. He notices that Fabricius ab Aquapendente, Hildanus, André Delacroix, Lanfranc, and Fallopius, all described the sarcocele under the name of "*caro adnata ad testem;*" but that since the time of these authors, who appear to have observed the sarcocele in warm climates, the moderns have usually applied the term to several diseases of the testicle itself. (See *Testicle.*)

The investigations of the same gentleman lead him to believe, that cases of enormous growth of the scrotum are endemial in warm countries, or, at least, that they are seldom observed in cold climates; since most of the examples, which have been seen in Europe, came from Asia and Africa. The scrotal tumour of M. Delacroix, formerly minister of external relations, says M. Larrey, is perhaps the only well authenticated instance of the origin of such a disease in our own climate; and it was also much smaller, than the instances related in the Ephemerides German. for the year 1692, in the surgical writings of Dionis, in the 9th vol. of the Bibliothéque de Médecine, and those which

M. Larrey was surprised to meet with in Egypt. The smallest of these latter, after they had attained their full size, weighed more than 25 kilograms (between 60 and 70 pounds.)

Several cases of this curious disease are recorded by other writers, particularly by Dr. Cheston, Dr. Titley, and the celebrated Sandifort. I lately saw in Mr. Abernethy's museum, a considerable fleshy substance, which was a portion of diseased scrotum.

In the cases, which M. Larrey had an opportunity of seeing in Egypt, the fleshy mass, into which the scrotum was converted, was broad below, and suspended from the pubes by a sort of pedicle. "Externally (as M. Larrey observes), the tumour presents rugosities of different sizes, separated by particular lines, or sinuses, to which the mucous cryptæ and roots of the hairs correspond. Upon a large portion of its surface, especially when the case is of long standing, yellowish scaly crusts are always seen, the detachment of which constantly leaves so many small herpetic ulcers, which emit an ichorous discharge. The tumour is indolent, and hard at some points, but softish at others. It may be handled, and pressed in different directions, without the least pain. The patient is only incommoded by its weight, and the impediment which it causes to his walking well. Hence, he is necessitated to employ a suspensory bandage. In consequence of the situation of the urethra, the urine dribbles over the swelling; but without causing any excoriation." In most of the cases, seen by M. Larrey, the spermatic chord and testicles were in the natural state, situated at the sides and at the root of the swelling. The spermatic vessels, however, are somewhat enlarged and elongated. All the patients were likewise more or less affected with elephantiasis.

M. Larrey attempts to explain the causes of the complaint in Egypt, but, as I think, without any degree of success. As the affection is seldom seen in cold countries, climate has certainly a chief effect. Employments which keep persons a good deal in a sitting posture; the loose breeches worn by the Egyptians, and the consequently pendulous state of the scrotum; diseases of the humours, and particularly itchy pustules, on the part, an ordinary consequence of syphilis in that country; bad regimen; abuse of venery; and the immoderate use of the warm bath; are merely conjectures, which will not bear the test of reasoning.

The enormous magnitude, which this sort of disease may attain, is almost incredible. The case, recorded in the Ephemerides German. weighed about a hundred kilograms, or more than two hundred weight. Another, described by M. Larrey, was calculated to weigh about one hundred and twenty pounds, and this surgeon likewise saw in Egypt ten, or twelve more instances, nearly as large, and all of the same character.

A very curious example, in which a similar disease affected the labia pudendi in a surprising degree, is also detailed by M. Larrey. The woman was a native of Cairo.

In the early stage of the disorder, we may try preparations of antimony combined with sudorifics; drinks acidulated with sulphuric acid, lotions containing the same acid, or the oxymuriate of mercury, the oxyde of copper, or the muriate of ammonia. These means are to be assisted by a gradual, uniform compression of the whole tumour. In one case, incisions and the application of caustic, proved of no service, and M. Larrey very properly condemns such experiments.

When the disease resists every plan tried for its relief, and its increase renders the patient's life irksome, and wretched, the extirpation of the tumour with a knife becomes proper. In this proceeding, the chief skill consists in doing no injury to the spermatic chords and testicles, which are generally perfectly sound. As the substance of the swelling is not furnished with large vessels, the hemorrhage need not be feared. Care must also be taken not to injure the corpora cavernosa penis, and the urethra. After the operation, the skin is to be brought over the exposed testicles, as much as possible, with adhesive plaster and a bandage.

M. Delonnes successfully removed the diseased mass in the celebrated case of the French minister Delacroix, and M. Larrey performed the same operation with success, when he was in Egypt. Dr. Titley, of the island of St. Christopher, also cut away such a tumour, which weighed seventy pounds, and the patient, who was a negro, and also affected with elephantiasis, speedily recovered. (See *Medico-Chirurgical Trans. Vol.* 6, *p.* 73, *&c.*)

It is probable, that some of the cases, which occur in warm countries, are analogous to the elephantiasis; but I do not believe, that the scaly incrustations, which are represented by M. Larrey as occurring in the cases, which he saw in Egypt, have been always noticed in the instances, which have taken place in colder countries. Nor, indeed, did they take place in the instance recorded by Dr. Titley, the surface of the tumour having been quite smooth. See *Larrey's Mémoires de Chirurgie Militaire, Tom.* 2, *p.* 110, *et seq. Richerand's Nosographie Chir. Tom.* 4, *p.* 314, *&c. Edit.* 4. Also *Delonnes' Memoir. Dr. Cheston's Case, &c. Med. Chir. Trans. Vol.* 6.

**SEARCHING.** The operation of introducing a metallic instrument, through the urethra into the bladder, for the purpose of ascertaining whether the patient has a stone or not. See *Sounding.*

**SETON.** (*Setaceum*, from *seta*, a bristle, because horse-hairs were formerly used for keeping open the wound.) A kind of issue. It is usually made by means of a particular needle, which is of various breadths, from half an inch to a full inch. The needle is commonly a little curved, but, if straight, it would be better calculated for the purpose. From the point, to its broadest part, it is double-edged, and, behind, it has a transverse eye, through which a skein of thread, or silk, of exactly the same breadth as the needle, is placed.

A fold of skin is to be pinched up, at the part where the seton is designed to be made, and the needle is to be pushed through it, together with the skein of thread, which is to be dipped in sweet oil. The instrument is not to be introduced too low into the base of the fold, nor too high, near its edge. In the first case, the muscles, and parts, which ought to be avoided, might be wounded; in the second, the interspace between the two wounds would be very narrow, and the seton soon make its way through it.

When no seton-needle is at hand, the fold of the skin may be punctured with a lancet, and the skein of thread introduced by means of an eye-probe. A seton may be applied almost to any part of the surface of the body, when circumstances require it; but, one of its openings should always be made lower, than the other, that the matter may readily flow out. The skein of thread is to remain untouched, for a few days after the operation, until the suppuration loosens it. Afterwards the part of the thread, nearest the wound, is to be smeared with oil, white cerate, or any digestive ointment, and drawn under the fleshy interspace between the two wounds, and what was there before is to be cut off. The seton is to be drawn in this manner once, or twice, a day, according as the quantity of matter may require. A new skein of silk, or thread, is to be attached to the preceding one, as often as necessary. Care is to be taken to keep the thread on the outside of the wound well covered, and free from the discharge, which would make it stiff and hard, and apt to occasion pain and bleeding on being drawn into the wound. If the discharge should be deficient in quantity, powdered cantharides may be mixed with the digestive ointment.

**SHINGLES.** See *Herpes.*

**SIGHT, DEFECTS OF.** There are persons, who, from their infancy, are incapable of distinguishing one colour from another. A man, who was affected with this infirmity, could not distinguish green at all. Green and red appeared to him the same. Yellow and blue he could discern very well. With regard to dark-red and dark-blue, he frequently made mistakes. In other respects, his vision was sound and acute. The father of this patient was afflicted with the same infirmity. The mother and one sister were free from it. Another sister and two of her children had it. The patient himself had two children, who did not labour under the disorder. (See *Phil. Trans. Vol.* 68, *Part* 2.) Another subject, whose eyes were in other respects healthy, and whose eyesight was sharp, could not distinguish a dark-green from a dark-red.

An interesting example of this curious imperfection of vision has lately been published by Dr. Nicholl, of Cowbridge. (See *Medico-Chirurgical Trans. Vol.* 7, *p.* 477, *&c.*) The subject was a healthy boy, eleven years of age, whose eyes were grey, with a yellow tinge surrounding the pupil. He never called any colour green. Dark bottled green he called brown. He could distinguish light yellow; but darker yellows and light browns, he confounded with red. Dark brown he mistook for black. Pale green he called light red; common green he termed red. Light red and pink he called light blue. Red he called by its proper name. He could distinguish blue, both dark and light. On the mother's side, the boy had some relations, whose sight was similarly affected.

Sometimes, objects appear to the eye to be of a different colour from what they really are, not because there is any thing wrong in the eye itself, but in consequence of the unclear and coloured light by which the object is illuminated. Thus, for instance, a bad tallow candle, which emits a yellow flame, makes every thing appear yellow. When brandy is burning, all objects appear blue. In short, it is only by the light of the sun, that any object can be seen in its clear natural hue. In certain cases, the infirmity is owing to the transparent parts and humours of the eye, which do not happen to be of a proper colour. Thus, persons having the jaundice in a high degree, see all things yellow, because the transparent parts of the eye are of that colour. When, in consequence of external violence applied to the eye, blood is effused, and the aqueous humour rendered red by this fluid, all objects seem to the patient to be red; and, white, when the aqueous humour has been made of this colour by the couching of a milky cataract. Sometimes this defect in vision is ascribable to the duration of an impression. When one has surveyed a bright coloured object a long while, as for example a bright red or yellow wall, on which the sun shines, that colour will often remain a good while before the eyes, although one may not be looking any more at an object of this hue. There are some eyes, which seem much disposed to retain the impression of objects, which are not very bright coloured; but, such a disposition always betrays great weakness and irritability of those organs. The most frequent cause of this defect in vision, is an irritation operating upon the optic nerves, so as to produce the irritability in them, which alone makes objects appear of one colour. The seat of such irritation, according to Richter, is also most commonly in the abdominal viscera, and the case demands evacuations, tonics, and anodyne medicines. But, the disorder may also originate from other causes. The operation of bright-coloured or shining objects upon the eye, sometimes has for a certain time afterwards, the effect of making objects of diverse colours appear to be moving before the eyes. In extreme terror, or fright, things may also seem to have a different colour from their real one. The same often happens in fevers attended with delirium. A sudden exposure of the head to cold, at a period, when it was perspiring much, in one instance, caused many coloured appearances before the eyes; but, the disorder subsided in a couple of days. (*Richter's Anfangsgr. der Wundarzneykunst, Band.* 3, *p.* 523.)

Also a healthy eye sees a distant object with uncertainty, and error, in a room, or space, the extent, length, and breadth, of which are unknown, when the size of the object itself is unascertained, and when there are few or no other objects intervening at a smaller distance between the eye and the thing looked at. The more numerous the objects are between the eye and the principal thing looked at, the more distant it is made to appear; the fewer they are, the nearer it seems to be. In a country covered with snow, and upon the sea, very distant objects appear to be close. The smaller an object is to the eye, in relation to its known magnitude, the further off it seems. The errors, which the eye makes, in regard to the distance of objects, also tend to deceive. But, there are certain cases, in which the eye is almost entirely incapable of judging of the distance of objects. The first is, when the object, of which we wish to ascertain the distance, is looked at with only one eye. Hence all one-eyed persons, and persons affected with strabismus, are unable to judge well of the real distance of objects. However they are only so for a certain time; and, by practice, they gradually acquire the faculty. Even when two eyes are employed, it requires some exercise, in order to enable them to judge of the right distance of objects. Persons, born blind, but who have their sight restored in both eyes by the operation for the cataract, are a long while incapable of judging of distances, and only obtain this power very gradually. Lastly, this infirmity is sometimes owing to an irritation affecting the optic nerves, whereby their sensibility is so altered, that distant objects make the impression upon them of near ones. In this circumstance, all objects appear to the patient closer than they really are. This is the only case, which admits of being treated as a disease. The irritation, producing the disorder, is mostly seated in the abdominal viscera, and requires evacuations and such medicines as invigorate the nerves. A suppression of the perspiration is alleged to be sometimes a cause. (*Richter's Anfangsgr. der Wundarzn. Band.* 3, *p.* 525.)

A sound eye likewise does not always judge with accuracy and uniformity of the magnitude of objects. This may arise from three causes. In order to judge rightly of the size of any thing, its precise distance must be known; for, the more remote it is, the smaller will it seem to the eye. Hence, any conjecture, respecting the magnitude of an object, is constantly erroneous, unless the distance be ascertained. Size is invariably something relative. A single large object, surrounded by many small ones, always appears to be larger, than it really is; et vice versâ. An object, whose magnitude is known, seems smaller, than it actually is, when one has been a little previously looking at another that is still larger. Lastly, the refraction of the rays of light in the eye, by which operation an object is made to appear large or small, is not always accomplished in the same degree, as the eye is not at all times equally full and distended with its humours. Hence, at one time, the same object will appear to the same eye, and at the same distance, larger; at another time, smaller. Sometimes, however, the eye judges so erroneously of the magnitude of objects, that there is reason for regarding the case as an infirmity, or disease. It is for the most part owing to a defective sensibility in the nerves, caused by some species of irritation acting upon the eye, and generally seated in the gastric organs. A man, to whom every thing seemed one half smaller and nearer, than it really was, was cured by means of an emetic, bark, an issue and valerian. (*Leutin, obs. fascic.*)

Sometimes to the eye, under circumstances of disease, straight lines appear serpentine; perpendicular objects, sloping, things standing upright, to be inverted, &c. All these cases are set down by Richter as depending upon a wrong sensibility of the nerves, occasioned by the effect of some irritation. The irritation, he says, may be of many kinds; but, experience proves, that it is mostly seated in the gastric organs. These defects of sight may generally be cured by first exhibiting emetics and purgatives, and afterwards having recourse to remedies for strengthening the nerves, bark, oleum animale, valerian, issues, &c. One mark of a very weak and irritable eye, is when objects, after being looked at a good while, and presenting a right appearance, begin to move, swim about, mix together, and, at length, become quite indistinguishable. This principally happens when the objects regarded are small and strongly illuminated. Here such remedies, both general, and topical, as have the effect of invigorating the nerves, are indicated. However, sometimes, the infirmity is partly owing to the operation of some species of irritation, which will require removal, ere the tonic medicines and applications can avail. Indeed, in particular cases, the dispersion of such irritation is alone sufficient to accomplish the cure.

Sometimes, all objects appear to the eye, as if they were in a more or less dense mist. This defect in vision is always owing either to some slight opacity of one of the humours of the eye, or to excessive debility of the optic nerves. (See *Richter's Anfangsgr. der Wundarzn. Band.* 3, *p.* 521, *&c.*)

**SINUS.**—A long, narrow, hollow track, leading from some abscess, diseased bone, &c.

**SOLUTIO ARGENTI NITRATI.**—℞. *Argenti Nitrati* ℈j. *Aq. Distillat.* ℥ss. *M.* This is a very good application for sores, which are frequently met with round the roots of the nails, both of the fingers and toes. It is also useful in herpetic affections, noli-me-tangere, and several kinds of ulcers. The proportion of the argentum nitratum may be lessened, or increased, as occasion requires. A strong solution of this substance is a good application for destroying warts, to which it must be applied by means of a hair-pencil. When used for sores, it is best to dip little bits of soft lint in it, lay them on the part affected, and cover them with a common pledget.

**SOLUTIO FERRI SULPHATIS.**—℞. *Ferri Sulphatis ad albidinem calcinati* ʒj. *Aq. Distillat.* ℥viij. *Misce.* Has been recommended as an application for sores on the nipple, and other ulcers.

**SOLUTIO HYDRARGYRI CUM PLUMBO.**—℞. *Hydrarg.* ʒij. *Plumbi* ʒiss. *Acidi Nitrosi* ℥j. The two metals are to be dissolved in the acid, in a glass vessel, placed in a sand heat. Plenck employs this caustic solution for destroying warts, and excrescences.

**SOUND.** An instrument, which surgeons introduce through the urethra into the bladder, in order to discover, whether there is a stone in this viscus, or not. The sound is usually made of very highly polished steel, that it may be well calculated for conveying to the surgeon's fingers the sensation of any thing, against which its end may strike. It is also generally rather less curved, than a catheter, so that its extremity may be more easily inclined to the lower part of the bladder, where the stone is most frequently situated.

**SOUNDING.** The operation of introducing the foregoing instrument.

Sounds are generally introduced much in the same way as catheters, either with the concavity towards the abdomen, or the convexity, in which last method, it is necessary, as soon as the beak of the sound has arrived in the perineum, to bring the handle of the instrument downward by a semicircular movement to the right, while the other end is kept as much fixed as possible. This is what the French term the coup, or tour de maître; a plan, that is often followed at the present day, though, except in very corpulent subjects, it has no particular recommendation.

When a patient is to be sounded, he is usually put into a posture very similar to that adopted in the lateral operation for the stone, with the exception that he is not bound in this position, as there is sometimes an advantage in making the patient stand up, in order that the stone may come into contact with the end of the sound. The instrument having been introduced, its extremity is to be turned, and moved in every direction, when, if there be a calculus, its presence will usually be indicated by the collision against the beak of the sound.

Stones have sometimes been found in the bladder after death, although they could never be discovered with a sound while the patient was alive, suffering all the symptoms of the complaint. The celebrated French surgeon La Peyronie was thus circumstanced: he was so fully convinced of there being a stone in his bladder, notwithstanding neither he, nor any of his friends could feel it with a sound, that, on his death-bed, he gave directions for ascertaining the fact. Hence, when the usual symptoms of a stone in the bladder continue, patients should be searched several times, before a positive opinion is delivered respecting the nature of the disease. When during the operation of sounding, all the urine has escaped from the bladder, the inner surface of this viscus comes into contact with the end of the sound, and such a sensation may be communicated to the surgeon's fingers as leads him to suspect that a fungus, or some other hardish extraneous substance, is contained in the bladder. In such cases, patients have actually been cut for the stone, when no foreign body whatever was present. (See *Sabatier's Médecine Opératoire, Tom.* 3. *p.* 127—128. *Edit.* 2, *and p.* 680 *of this Dictionary.*)

**SPE'CULUM.** An instrument intended for facilitating the examination of parts, and also the performance of operations on them: thus we have specula ani, specula oculi, auris, &c.

**SPHA'CELUS.** (from σφαζω, to destroy.) Surgeons imply, by this word, complete mortification, which is mostly preceded by a stage of the disorder, termed *gangrene.* See *Mortification.*

**SPICA.** (from σπαχὺς, an ear of corn.) A name, given to a kind of bandage, in consequence of its turns being thought to resemble the rows of an ear of corn.

In order to apply the spica bandage, employed in dislocations of the shoulder, we are to take a common single-headed roller, and place the end of it under the opposite arm-pit. After conveying the bandage backward, obliquely over the shoulders, we are then to bring it forward over the head of the dislocated bone. The roller is next to descend under the arm-pit, then be carried upward again, and made to cross on the deltoid muscle. The roller is now to be carried obliquely downward over the front of the chest, and under the opposite arm-pit, where the end of it is to be pinned, or stitched. The bandage is next to pass across the back, over the part of the roller previously applied in this situation, and is to be conveyed round the head of the os brachii, so as to form a turn, or *doloire,* with the first circle of the roller. Three, or four *doloires,* or turns, each of which covers about one-third of the preceding one, are to be made, and then the upper part of the arm is to be once surrounded with a plain circle of the bandage. This last circular application leaves between it, and the cross previously made, a triangular, equilateral, space, technically named by writers *geranis.* The roller is now to be carried upward in a spiral manner; its head is to be brought to the opposite arm-pit, and the application of the whole concludes with a few turns round the body. The bandage is to be fastened with pins at the place where it commenced.

Before putting on the spica, the injured part, and margin of the axillæ, must be guarded from the effects of the pressure by compresses.

The spica bandage for the broken clavicle is applied in the same manner, with the exception, that the crossings are made over this bone. It is proper to state in this place, that the spica is a very ineffectual bandage, for this kind of accident. (See *Fractures of the Clavicle.*)

In order to apply, what is named, the *spica inguinis,* the end of the roller is to be placed on the spine of the os ilium, of the affected side. The bandage is then to be carried obliquely over the groin, and under the perinæum. Then it is to pass over the back of the thigh, and next forward, so as to cross the part previously applied on the front of the groin. The application is continued by carrying the roller over the pubes, over the opposite os ilium, and next round the body above the buttocks. The bandage thus returns to the place, where it began. Its application is completed by making a few doloires, and turns, like the preceding ones, and lastly, a few turns round the body.

The spica for the thigh is applied in the same way; only the crossings are to be made on the upper and outer part of the limb. (See *Encyclopédie Méthodique, Part. Chirurgicale, Art. Spica.*)

**SPINA BIFIDA.** (i. e. the Cloven Spine.) *Hydro-Rachitis.* A disease, attended with an incomplete state of some of the vertebræ, and a fluid swelling, which is most commonly situated over the lower lumbar vertebræ, sometimes over the dorsal and cervical ones, and in some instances, over the os sacrum. The same name has also been given to an analogous tumour, which sometimes occurs on children's heads, attended with an imperfect ossification of a part of the cranium.

The Arabians, who first treated of this disease, erroneously imputed the deficiency of one, or more of the spinous processes to the tumour, while it is now well known, that the incomplete state of the affected vertebræ is a congenital malformation, and that the swelling is only an effect. In fact, the tumour generally becomes larger and larger, the longer it continues. The spina bifida may be regarded as an affliction only met with in children: few, very few, live to the adult age with this incurable affection. Warner, however, has related a case, in which the patient lived till he was twenty.—(*Cases in Surgery, p.* 134, *Edit.* 4.)

As I have remarked, the swelling is most frequently situated towards the lower part of the spinal canal, particularly at the place, where the lumbar vertebræ join the sacrum. The fluid, which it contains, resembles serum, being somewhat more liquid, than the white-of-egg, and, like the latter, frequently coagulable. It is in general limpid and colourless; but, occasionally, it is turbid, and tinged with blood. On pressing the tumour, a fluctuation is very perceptible, and a preternatural space may also be felt existing between some of the spinous processes. The fluid is contained in a kind of cyst, which is composed of the continuation of the dura mater, investing the spinal canal, and is usually closely adherent to the integuments.

Spina bifida is sometimes attended with hydrocephalus. It has even been recorded, that the enlargement of the head has undergone a considerable diminution, when the tumour of the spine casually burst, and discharged the fluid, which it contained; a proof of some communication between the two parts. (*Ephem. Cur. Nat. Decad.* 3, *Ar.* 1, *Decad.* 2, *Art.* 2.) The fluid, which was lodged in the lateral ventricles, and third ventricle, passed into the fourth, through the aquaductus Sylvii, ruptured the calamus scriptorius, and thus got into the spinal canal.

Spinæ bifidæ usually occur on the lower part of the spine; but, they occasionally take place on the cervical vertebræ, in which latter situation, the tumours have the same characteristic marks, as those which form near the sacrum. Many facts, recorded by Ruysch, in his Anatomical Observations, confirm the preceding account.

The present affliction is one of a most incurable nature; at least, (with the exception of two or three examples recently published by Mr. Astley Cooper,) there is not, I believe, in all the records of medicine, or surgery, any case, which either got well of itself, or was benefited by any mode of treatment. Opening the tumour, either with caustics, or cutting instruments, has hitherto only tended to hasten the fatal event of the disease. Death soon follows an operation of this kind, and, it is said, that the child sometimes dies immediately. Tulpius observes on this subject; *quam calamitatem si quidem reformides, chirurge, cave sis improvidè aperias quod tam facilè occidit hominem.* Observ. Med.

But, whether the tumour be opened, or not, still the disease is one of the most fatal, to which children are exposed. When afflicted with it, they very seldom live till three years of age: but, after lingering several months from their birth, suddenly die. It has been said, that children, with spina bifida, always have their legs in a paralytic state. This, however, is not true; for, the largest spina bifida I ever saw, was under my friend Mr. Maul, of Southampton, and was unattended with any weakness of the legs. Indeed, the child was, to all appearances, as stout, healthy, and full of play, as possible. The fatal event, however, took place after a time, as usual; and, if my memory does not fail me, Mr. Maul noticed, that a little before death, a remarkable subsidence of the swelling occurred, though it never burst externally. It is a fact, notwithstanding, that many infants, with spina bifida, have paralytic legs, and can neither retain their feces, nor urine.

If we draw our inferences from the cases, and remarks, offered by almost every writer on spina bifida, we must regard all attempts to cure the disorder, by making any kind of opening, as exceedingly perilous, if not positively fatal. It is to be observed, at the same time, that some very eminent surgical authors have not altogether abandoned the idea of devising a mode of accomplishing a cure, at least, in a few instances. Mr. B. Bell says, that if the tumour proceeded from disease of the spinal marrow, or its membranes, no means of cure will probably ever be discovered. But, if the deficiency in the spinous processes of the vertebræ, with which the disease is always accompanied, is not an effect of the complaint, as was commonly imagined, and if the collection of fluid takes place, from the want of resistance in the dura mater, in consequence of the imperfection of the bones, Mr. B. Bell questions, whether it would not be proper to tie the base of the tumour with a ligature, not merely with a view of removing the swelling, but in order to resist the propulsion of the cyst further outward. Mr. Bell acknowledges, that the event of this practice must be considered as very dubious; but, expresses his wish to devise any plan, that would afford even the least chance of success, in a case which must terminate in an unfavourable manner. Mr. Bell mentioned his design of putting the method to a trial, on the first opportunity, and after the detachment of the swelling on the outside of the ligature, he intended to keep a soft compress on the part with a proper bandage. I do not know whether this gentleman ever put the above scheme in practice; but, suppose not. It is properly objected to by the author of the article *Spina Bifida*, in the *Encyclopédie Méthodique, Part. Chir.* because the disease is often attended with other mischief of the spinal marrow and brain, and the base of the swelling is almost always too large to admit of being tied at all, or not without hazard of dangerous consequences.

Richter has proposed the trial of two caustic issues at a little distance from the swelling; but, I am not acquainted with any facts in favour of this practice.

Mr. Abernethy first suggested trying a gentle degree of pressure on the tumour from its commencement, with a view of producing absorption of the fluid, and preventing the distention of the unsupported dura mater. Were the fluid to continue to increase, notwithstanding such pressure, Mr. Abernethy thinks, that as death would be inevitable on the tumour bursting, it might be vindicable to let out the fluid, by means of a puncture, made with a finely-cutting instrument. The wound is to be immediately afterwards closed with sticking-plaster, and, if possible, healed. Another accumulation is then to be prevented, if practicable, with bandages and topical applications. Mr. Abernethy actually made the experiment of trying a puncture in one hopeless instance, in which indeed, the swelling had previously just begun to burst. The puncture was repeated, every fourth day, for six weeks, during which time the child's health continued unaffected. The wounds were regularly healed; but the plaster having been rubbed off one of the punctures, the part ulcerated, the opening could not be healed, the discharge, from having been of an aqueous quality, became purulent, and death ensued. This case was unfavourable for the trial of the method, as the integuments covering the tumour were diseased, and had no disposition to contract.

The annexed case, published by Mr. Astley Cooper, will serve to shew the benefit, which may be derived from pressure.

" James Applebee, Baldwin Street, Old Street, was born on the 19th of May, 1807, and his mother, immediately after his birth, observed a round and transparent tumour on the loins, of the size of a large walnut.

" Mr. Deering, who was her accoucheur, requested Dr. Petch to see the child with him, who informed the mother of the dangerous nature of the complaint, and of the probability of its fatal termination,

" On the 22d of June, 1807, the child was brought to my house, and I found, that although it had spina bifida, the head was not unusually large; that the motions of its legs were perfect; and its stools and urine were discharged naturally.

" I applied a roller around the child's waist, so as to compress the tumour, being induced to do so from considering it as a species of hernia, and that the deficiency of the spine might be compensated for by external pressure.

" The pressure, made by the roller, had no unpleasant influence on its voluntary powers; its stools and urine continued to be properly discharged, but the mother thought, that the child was occasionally convulsed.

" At the end of a week, a piece of plaster of Paris, somewhat hollowed, and that hollow partly filled with a piece of lint, was placed upon the surface of the tumour: a strap of adhesive plaster was applied to prevent its changing its situation, and a roller was carried around the waist, to bind the plaster of Paris firmly upon the back, and to compress the tumour as much as the child could bear.

" This treatment was continued until the month of October, during which time, the tumour was examined about three times a week, and the mother reported, that the child was occasionally convulsed.

" When the child was five months old, a truss was applied, similar in form to that, which I sometimes use for umbilical hernia in children, and this has been continued ever since.

" At the age of fifteen months, it began to make use of its limbs; it could crawl along a passage, and up two pair of stairs.

" At eighteen months, by some accident, the truss slipped from the tumour, which had become of the size of a small orange, and the mother observed, when it was reduced, that the child appeared in some degree dull; and this was always the case, if the truss was left off for a few minutes, and then re-applied.

" At fifteen months, he began to talk; and at two years of age, he could walk alone.

" He now goes to school, runs, jumps, and plays about, as other children. His powers of mind do not appear to differ from those of other children. His memory is retentive, and he learns with facility. He had the measles and small-pox in the first year, and the hooping-cough at three years. His head, previously and subsequently to the bones closing, has preserved a proper proportion to the other parts of the body.

" The tumour is kept by the truss entirely within the channel of the spine; but, when the truss is removed, it soon becomes of the size of half a small orange. It is therefore necessary, that the use of the truss should be continued. When the truss is removed, the finger can be readily pressed through the tumour into the channel of the spine." (*Medico-Chirurgical Transactions, Vol. 2, p. 323, &c.*)

The next case, also published by Mr. Astley Cooper, will prove, that spinæ bifidæ may sometimes be treated on another plan, so as to accomplish a permanent cure.

" January 21st, 1809, Mrs. Little, of No. 27, Limehouse Causeway, brought to my house her son, aged ten weeks, who was the subject of spina bifida.

" The tumour was situated on the loins; it was soft, elastic, and transparent; and its size about as large as a billiard-ball when cut in half; his legs were perfectly sensible, and his urine and feces were under the power of the will, &c.

" Having endeavoured to push the water, contained in the tumour, into the channel of the spine, and finding that if the whole was returned, the pressure would be too great upon the brain; I thought it a fair opportunity of trying what would be the effect of evacuating the swelling by means of a very fine pointed instrument, and by subsequent pressure to bring it into the state of the spina bifida in Applebee's child.

" I therefore immediately punctured the tumour with a needle, and drew off about two ounces of water.

" On the 25th of January, finding the tumour as large as before it had been punctured, I opened it again, and in the same manner, and discharged about four ounces of fluid. The child cried when the fluid was evacuated, but not whilst it was passing off.

"On January 28th, the tumour was as large as at first, I opened it again, and discharged the fluid. A roller was applied over the tumour, and around the abdomen.

"February 1st, it was again pricked, and two ounces of fluid discharged.

"On the 4th, three ounces of fluid were discharged.

"On February 9th, the same quantity of fluid was evacuated as on the 4th; but, instead of its being perfectly clear, as at first, it was now sanious, and it had been gradually becoming so in the three former operations.

"On the 13th, the same quantity of fluid was taken away; a flannel roller was applied over the tumour and around the abdomen; a piece of pasteboard was placed upon the flannel roller over the tumour, and another roller over the pasteboard to confine it.

"On the 17th, three ounces of fluid, of a more limpid kind, were discharged; the pasteboard was again applied.

"On the 27th, the surface of the tumour inflamed; the fluid, not more than half its former quantity, was mixed with coagulable lymph, and the child, suffering considerable constitutional irritation, was ordered calomel and scammony, and the rollers were discontinued.

"February 26th, the tumour was not more than a quarter of its former size; it felt solid; the integuments were thickened, and it had all the appearance of having undergone the adhesive inflammation.

"On the 28th, it was still more reduced in size, and felt solid.

"On March 4th, it was in the same state as on the 28th of February.

"March 8th, the swelling was very much lessened; the skin over it thickened and wrinkled; a roller was again had recourse to; a card was put over the tumour; and a second roller was applied.

"March 11th, the tumour was much reduced; the skin covering it was a little ulcerated. On the 15th, it was flat, but still a little ulcerated.

"On the 27th, the effused coagulable lymph was considerably reduced in quantity, and of a very firm consistence.

"On the 2d of May, nothing more, than a loose pendulous bag of skin remained, and the child, appearing to be perfectly well, the bandage was soon left off.

"On December 18th, it was attacked with the small-pox, and went well through the disease.

"The skin now hangs flaccid from the basis of the sacrum; its centre is drawn to the spine, to which it is united, and thus the appearance of a navel is produced in the tumour by retraction of the skin.

"The pricks of the needles are very obvious on each of the punctured parts of the tumour, forming slight indentations." (See *Medico-Chirurgical Transactions, Vol.* 2, *p.* 326—329.)

At the time when Mr. A. Cooper transmitted this case to the Medico-Chirurgical Society, it had been under his observation two years and a half.

The first of the preceding observations exemplifies the palliative treatment, adopted by the latter gentleman, and consisting of the application of pressure, in the manner of a truss for hernia; the second shews the radical mode of cure by puncturing the swelling from time to time with a needle, and exciting the adhesive inflammation, which, with the assistance of pressure, stops the disease altogether, that is to say, in such examples as admit of cure.

Children are sometimes born with tumours, which are analogous to spinæ bifidæ, but situated on the head. There is a deficiency of bone at some part of the skull, and through the opening a sac, composed of the dura mater, protrudes, covered only by the integuments. Mr. Earle lately met with such a swelling situated upon the occiput of a female infant. The plan of repeatedly making small punctures with a common needle, discharging the fluid, healing up the punctures, and applying pressure, was tried, and followed up for some time without the occurrence of any unpleasant symptoms. Punctures were sometimes even made with an ordinary lancet; yet, the child suffered no harm from the operation, and some hopes of a cure were indulged. At length, however, ulceration of the swelling took place, the child became indisposed, and rapidly sunk. (See *Medico-Chir. Trans. Vol.* 7, *p.* 427.)

Consult *Ruyschii Observ. Anat. Warner's Cases in Surgery. B. Bell's System of Surgery, Vol.* 5. *Callisen's Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 40, *&c. Hafniæ,* 1800. *Lassus, Pathologie Chirurgicale, Tom.* 1, *p.* 260, *et seq. Edit.* 1809. *Abernethy's Surgical and Physiological Essays, Part* 1 *and* 3. *Encyclopédie Méthodique; Part. Chir. Art. Spina Bifida. Richter's Anfangsgr. der Wundarzneykunst, B.* 5, *Kap. A. Cooper in Medico-Chirurgical Transactions, Vol.* 2, *p.* 322, *&c. H. Earle, in the same work, Vol.* 7, *p.* 427, *&c.*

**SPINA VENTOSA.** The Arabian writers first employed this term to express a disease, in which matter formed in the interior of a bone, and afterwards made its way outward beneath the skin.

Until the matter had escaped from within the bone, these authors describe, that the pain was incessant and intolerable; but that after the pus had made its way outward by fistulous openings, the pain underwent a considerable diminution. The matter sometimes insinuated itself, from the interior of the bone, into the cavities of the cellular substance, so as to render them soft and flabby, unattended occasionally with any change of colour in the skin. The swelling had some of the appearance of emphysema. To express this state, the Arabians added the term *ventosa* to that of *spina*, which was employed, before their time, to describe the nature of the pain attendant on the disease. See an account of this subject in the *Encyclopédie Méthodique, Part. Chir. Art. Spina Ventosa.*

The term *spina ventosa* has, since the time of the Arabian writers, been used by many to signify the disease named *white-swelling*, and the former might also mean by it a similar affection, though we should infer the contrary from their account of the matter passing from the interior of the bone to get under the integuments, a thing which I believe never yet happened in any case of white-swelling. Another, and, perhaps, a decisive argument, against the original signification of the word being the same as that of white-swelling, is, that it was not restricted to diseases of the joints and heads of the bones; but was also applied to abscesses, which commenced in the cavities of the middle portions of the long bones, on which parts, I need hardly observe, white-swellings never make their attack.

For these reasons many respectable authors have implied by the term *spina ventosa* an abscess, in the interior of a bone. See, on this subject, *Latta's System of Surgery, vol. 1, p.* 165. Cases of this latter kind, I know, are infinitely rare, compared with that common disorder, the white-swelling; and, I am also certain, from the descriptions given by some authors, that their cases of spina ventosa were in reality instances of necrosis. But, that abscesses do occur, and begin in the interior of the bones, more particularly of those of young persons, I have no doubt myself, both from two or three cases, which I remember having seen in St. Bartholomew's Hospital, and from some cases recorded by the most authentic writers. I cannot conceive, however, that suppuration can take place to any extent within a long bone, without being followed by necrosis, or as many writers improperly term it, caries.

J. L. Petit relates, that a man, with a tumour on the middle of the tibia, who had been treated by him as a venereal patient, found, a fortnight afterwards, that the pains, which had never ceased, now began to grow more violent. The patient was feverish, his leg became red, and even painful, externally. An incision was made in the situation of the tumour with a view of letting out the matter which was suspected to be the occasion of the bad symptoms, and to have insinuated itself under the periosteum. The incision was of no service, and, two days afterwards, the trepan was applied, by which means, a large quantity of matter was let out. The medullary part of the bone seemed quite annihilated, and the cavity almost empty. Petit made three other perforations with the trepan, and cut away the intervening pieces of bone. The actual cautery was also used several times to destroy the caries, and the patient at length got well. (*Traité des Maladies des Os, de J. L. Petit.*) If any one doubt, that abscesses now and then form in the middle of the long bones, I must request him to consult Mr. Hey's *Practical Observations in Surgery, p.* 22, where he may peruse two very interesting cases illustrative of what Mr. Hey calls *Abscess in the Tibia with Caries.*

It must be confessed, however, that these were only cases of necrosis, for which affection of the bone the term caries is too often inaccurately used. Indeed, it would appear, from the observations of Dr. Macartney, that a very small suppuration in the medulla is accompanied with the beginning of those changes of the periosteum, which attend necrosis. (See *Necrosis, p.* 762.)

For an account of spina ventosa, in the sense of white-swelling, refer to *Joints.*

**SPIRITUS AMMONIÆ COMPOSITUS.** Besides the well known uses of this medicine internally exhibited, its vapours are an exceedingly proper application to the eye in some cases of chronic ophthalmy. Scarpa recommends a remedy of a similar nature.

**SPLINTS.** Long thin pieces of wood, or tin, or strong pasteboard, employed for preventing the ends of broken bones from moving so as to interrupt the process by which fractures unite. These instruments are sometimes used in other cases, for the purpose of keeping limbs from moving, particularly in some kinds of dislocations, wounds, &c.

In simple fractures of the arm, forearm, or even of the thigh, or leg, in young infants, it matters not whether the splints be made of wood, pasteboard, or tin. In this country, surgeons usually keep sets of splints made expressly for the leg. These are of different sizes, excavated and shaped to the part, and furnished below with apertures for the projecting malleoli. When the limb is laid upon its outside, the foot is also usually supported and kept steady by the under splint extending some distance towards the toes. Very excellent splints for the legs of young children are made of strong pasteboard, accommodated in shape to the contour of the limb. Splints for the thigh, arm, and forearm, whether made of tin, or wood, should always be slightly concave on the side, which is to be applied to the broken limb. They should likewise be made as thin and light, as is consistent with the necessary degree of strength for preventing the broken bone from bending. The sets of splints, which are used for fractured legs and thighs in England, are frequently furnished with straps, which have a great many small perforations in them at stated distances, and can thus be easily fastened by means of little pegs for the purpose. Tapes are also sometimes employed; but they often get loose, and cannot be depended upon so well as leather straps. Pasteboard, as a material for splints, has one advantage; viz. when wet, it becomes soft, and admits of being accurately applied to every point of the surface of the limb: consequently, as soon as it dries and recovers its firmness again, it retains the exact shape of the part, and makes every where equal pressure on it, without incommoding the patient. Pasteboard, however, is hardly strong and durable enough for many fractures; nor will it answer when there is any discharge, or when the surgeon wishes to employ any fluid applications. But, it is generally allowed that no substance is better calculated for supporting the fractured lower jaw; for, it is perfectly strong enough for this particular case, and if wet before being applied, it forms when dry a solid covering, most accurately corresponding to the shape of the jaw.

Whatever may be the substance, of which splints are made, they ought always to be at least as long as the fractured bone; and if the situation of the limb will allow, they ought, says Boyer, to extend its whole length. "For instance, (says he) for simple fractures of the thighs of very young children, the pasteboard splints, which I employ, reach from the upper part of the thigh, to the lower part of the leg. Generally speaking, the longer splints are, the better they fix the limb, and keep the fracture steady." (*Boyer, Traité des Mal. Chir. T.* 3, *p.* 50.)

The number of splints must depend upon their breadth, and the thickness of the limb. For the forearm, two are sufficient; for the upper arm and thigh four are often used; and for the leg two, and sometimes three.

In cases of fractured thighs, when the traight position is preferred, the external splint should extend from the crista of the ilium to some little distance beyond the sole of the foot; while the inner one should reach from the upper and internal part of the thigh also beyond the sole of the foot. With respect to the anterior splint, it is indifferent, whether it only reaches from the groin to the knee, or as far as the lower part of the leg.

The lateral splints, for a broken leg, ought to be sufficiently long to embrace the knee, and confine the motions of the foot and ankle. When the straight posture is adopted, a splint is frequently laid along the front of the leg, from the patella to the lower part of the tibia. None however can ever be required under the limb, as there the bedding itself more conveniently affords the necessary degree of support.

Of all the different pieces of the apparatus for the treatment of fractures, the splints are by far the most important and essential. Without them, indeed, it would be in vain to attempt to keep the extremities of the fracture from being displaced.

As splints are generally composed of hard materials, the bad effects of their pressure upon the skin must always be counteracted by placing a sufficient quantity of tow, wool, or other soft substance between them and the limb.

In order to understand, however, the principles, which should guide the surgeon in the choice and application of splints, many remarks, offered in the article *Fracture,* must be consulted.

SPONGIA PRÆPARATA. (*Prepared Sponge; Sponge-tent.*) This is formed by dipping pieces of sponge in hot melted emplastrum ceræ compositum, and pressing them between two iron plates. As soon as cold, the substance thus formed, may be cut into pieces of any shape. It was formerly much used for dilating small openings, for which it was well adapted, as when the wax melted, the elasticity of the sponge made it expand and distend the opening, into which it had been put. The best modern surgeons seldom employ it.

SPONGIA USTA. (*Burnt Sponge.*)—This is often given in the form of lozenges, in cases of bronchocele, in which particular instances much efficacy is imputed to allowing the lozenges to dissolve gradually in the mouth, after putting them under the tongue. Burnt sponge is also exhibited in many scrofulous diseases. Its good effects are supposed to depend on the quantity of soda which it contains. The dose is from a scruple to a dram.

STAFF. An instrument of considerable importance in the operation of lithotomy, being in fact the director for the gorget, or knife, after the completion of the external incision. It is made of steel, and its handle is generally rough, in order that it may be more securely held. As it is intended to be introduced through the urethra, its shape ought to be principally determined by the natural course of that passage. The English generally employ a staff, the curvature of which forms the segment of a larger circle, than that described by the curvature of a staff used by French practitioners. (See *Roux, Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise, &c. p.* 319.) In other words, the French staff turns more upward, than ours, as it approaches and enters the bladder. There may be some advantage in this construction, inasmuch as it tends to make the gorget enter in the direction of the long axis of the bladder; yet, a great deal more seems to me to depend upon the position in which the staff is held, than upon its shape. Lithotomists should always employ as large a staff as can be easily introduced, because the operation will thereby be facilitated. The groove, the most important part of the staff, is of course situated upon the convexity of the curved part of the instrument, or upon that portion, which, when introduced, lies in the membranous part of the urethra, prostate gland, and the bladder. The termination of the groove, at the end of the instrument, should always be closed, so as to stop the further entrance of the gorget, and prevent the beak of the latter instrument from doing mischief. English surgeons have been justly censured by Desault, and Sabatier, for neglecting this essential caution; for, certainly, the most fatal injury has been done by the gorget slipping beyond the end of the staff. (See *Lithotomy.*) For my own part, if I am more sure of any one thing in surgery, than another, it is this, that the beak of a gorget ought never to pass out of, or beyond, the groove of the staff.

**STAPHYLOMA.** (from ςαφυλη, a grape.) A disease of the eye, so named from its being thought to resemble a grape. Staphyloma is that disease of the eyeball, in which the cornea loses its natural transparency, rises above the level of the eye, and successively even projects beyond the eyelids, in the form of an elongated, whitish, or pearl-coloured tumour, which is sometimes smooth, sometimes uneven, and is attended with total loss of sight.

Scarpa observes, that infants are often attacked by this disease soon after their birth, and mostly in consequence of the purulent ophthalmy. It is also produced by the small-pox, yet never during its eruption, which is singular; nor during the stage of suppuration; but, when the pustules dry, and even after the detachment of the variolous scabs.

In a great number of subjects, says Scarpa, when the staphyloma has attained a certain elevation above the cornea, it becomes stationary, or only increases in due proportion to the rest of the eye. In other instances, the small tumour of the cornea successively enlarges in all its dimensions, and in such a disproportion to the rest of the eye, that it at length protrudes considerably between the eyelids, to the great molestation and deformity of the patient.

This disease is justly considered as one of the most serious, to which the eyeball is subject; for, to the total and irremediable loss of sight that it occasions, are added all the evils which necessarily result from the bulk and protuberance of the staphyloma, after the swelling of the cornea has acquired such a size, that it can no longer be covered by the eyelids. In such circumstances, the continual exposure of the eyeball to the contact of the air, and particles of matter suspended in it; the friction of the eyelashes against it; the incessant flux of tears down the subjacent cheek; are enough to render the eye painful and inflamed; the sound one is affected by sympathy, and the diseased one at length ulcerates, together with the lower eyelid and cheek, on which it presses.

Scarpa next remarks, that surgeons have long thought, that, in this disease, the cornea yields to the distention produced by the turgescence of the humours of the eye, nearly in the same manner as the peritoneum yields to the pressure of the abdominal viscera, when an intestinal hernia takes place. Richter (*Obs. Chir. Fasc.* 2.) has opposed this theory, observing, that the staphyloma, for the most part, forms, without the swelling of the cornea having been preceded by any of those morbific dispositions, which are generally considered capable of weakening the texture and elasticity of the cornea; that this membrane, when affected with staphyloma, acquires a much greater thickness than what it has in its natural state, and, consequently, that the staphyloma, far from being concave within, is every where compact and solid; though it ought to be quite the contrary, if the tumour had been occasioned by an immoderate distention, operating on the cornea from within outward, with an absorption of its natural texture.

In regard to this circumstance, says Scarpa, though I would wish to give Richter all the praise, to which he is entitled for his conspicuous merit in every branch of the healing art, I cannot refrain from noticing, that this celebrated author, in pointing out a matter of fact, as he has done, respecting the origin and nature of the staphyloma, has generalized his doctrine too much, by not drawing any line of distinction between the staphyloma of recent occurrence in infants, and that of adult subjects, in whom the disease has acquired so large a volume, as to protrude considerably beyond the eyelids. I fully agree with Richter, (for it is a certain and demonstrable fact,) that the recent staphyloma in infants is quite compact and solid, on account of the augmented thickness of the cornea in this disease; but it is equally certain, as I have been convinced by repeated observation, that, in this very same staphyloma, originally quite solid and compact, the cornea, strictly speaking, becomes thinner, or, at all events, is not thicker, than in its natural state, after the disease has existed a series of years in adult subjects, and in whom the swelling of the cornea has attained such a size, as to protrude between the eyelids. I wish to imply, that the tumour is not solid throughout, except in regard to its containing, in its amplified state, the iris, the crystalline, and very often, also, a portion of the vitreous humour. These parts, having quitted their natural position, are propelled forward, so as to fill the cavity, which gradually forms in the cornea, and grows larger.

The cornea of infants, in its natural state, is, at least, twice as thick and pulpy as that of adults, and, consequently, the anterior chamber of the aqueous humour, in the former, is comparatively so contracted, to what it is in the latter, that, in infants at the breast, the cornea may be considered as in contact with the iris. In the latter subjects, the softness, flexibility, and succulency of the cornea are naturally such, that, when this membrane is separated from the rest of the eye in the dead subject, and compressed between the fingers, it loses, at least, one half of its volume, and thickness, which does not happen in adults. The cornea of young children is so supple and distensible, that, in minute injections of the head, when the injected matter is copiously extravasated in the eye-ball, the cornea distended from behind forward, elevates itself in the dead subject considerably towards the eyelids; a thing, says Scarpa, that is not observable, under similar circumstances, in the eyes of adults.

To such qualities of the cornea, in children of tender years, and to the natural narrowness of the anterior chamber of the aqueous humour, Scarpa imputes the cause, why ophthalmies in infants so often produce opacity and thickening of this membrane. The cornea swells, becomes preternaturally thickened, and is very soon converted into a pointed, whitish, or pearl coloured tumour, without any cavity internally, and either in perfect contact with, or adherent to, the iris. In the course of years, however, Scarpa remarks, that this disease undergoes new modifications. For, as the whole eye enlarges with age, the iris, and crystalline, from causes not sufficiently understood, abandon their natural situation, and are incessantly urged forward. This effect is increased, by the very limpid and copious state of the vitreous humour, always existing, when the disease under consideration is inveterate. In this circumstance, whenever the cornea is not completely indurated, and inflexible, the crystalline and iris are insensibly propelled, from within outward, nearer and nearer to the cornea, which they in time distend in all its dimensions, so as to make it project beyond the eyelids, at the same time rendering it thinner in a ratio to the bulk, and magnitude, which it assumes. Scarpa has never met with a voluminous staphyloma, projecting beyond the eyelids in adult persons, which had not originally made its first appearance in infancy; and he has invariably found, that the thickness, and density of the cornea, both in the living, and dead bodies of those, who have been affected with this disease, were in an inverse ratio to the eye. In inveterate cases of staphyloma, forming a large protuberance beyond the eyelids, the iris may here and there be clearly discerned through the diseased cornea, and, if it be not equally manifest at all points of the tumour, it is because the conjunctiva externally spread over the cornea forms, in conjunction with its varicose vessels, on the surface of the tumour, a stratum of matter, not every where equally dense, and opaque. This dense stratum of the conjunctiva, spread over the cornea, easily causes deception, in the staphyloma that has attained a considerable bulk. The more the tumour increases, the more the substance of the cornea seems to become dense and thickened; while, in reality, the contrary happens; for the augmentation in the density of the layer of the conjunctiva, covering the cornea, only partly supplies the diminution in the thickness of the texture of this last membrane. Scarpa thinks it very improbable, that the accurate observers of all ages would have neglected to notice, that the cornea, in this advanced stage of the disease, instead of being thinner, according to the common opinion, is even quite a compact and solid body. Scarpa says, the contrary is recorded in their works, where they speak of the extirpation of thick staphylomas by means of a ligature, and they caution us to tie the thread very gently, lest the cornea, which, in these cases, is very thin, should easily be torn. Gunz relates, that he was an eye-witness of such an accident, which happened to a patient, in whom a staphyloma had been tied by means of a needle, and thread. (*De Staphylom. Dissect. vid. Disput. Chir. Halleri.*)

Scarpa allows, that Richter's doctrine is then a matter of fact, as it relates to the recent staphyloma of infants; but, as far as his own experience goes, it admits of exceptions, in regard to the thickness of the cornea, in the staphyloma of old date, considerable bulk, protruding beyond the eyelids.

Some pretend, says Scarpa, that the sclerotica is also subject to staphyloma, that is, to a partial distention, and prominence of its anterior hemisphere in the white of the eye. Others question the existence of such a disease. Scarpa acknowledges, indeed, that he has never yet met with any tumour, or prominence on the front surface of the sclerotica, corresponding to the white of the eye. On the contrary, what will seem extraordinary and singular, this celebrated surgeon has twice seen, in the dead subject, a staphyloma, in the posterior hemisphere of the sclerotica, a situation, in which it has neither been seen, nor described, by any one, as far as Scarpa knows. The first instance was in an eye, removed for quite another motive, from the body of a woman, forty years of age. This eye was of an oval shape, and altogether larger than the other, which was healthy. On its posterior hemisphere, on the outside of the optic nerve, or the part nearest the temple of the same side, the sclerotica was elevated, in the form of an oblong tumour, resembling a small nut. As the cornea was healthy and pellucid, and the humours still retained their natural transparency, on looking into the pupil of the eye, in question, an unusual brilliancy could be seen at the bottom, formed there by the light passing through that part of the cornea, affected with staphyloma, which had become thinner, and diaphanous. On opening this eye, Scarpa found the whole of the vitreous humour deranged in its organization, and converted into a limpid, aqueous fluid, and the crystalline somewhat yellowish, but not opaque. The posterior hemisphere of the eye being immersed in spirit of wine, to which a few drops of nitrous acid had been added, in order to give to the retina consistence, and opacity, Scarpa could distinctly discern, that the cavity of the staphyloma, in the sclerotica, was not invested with the nervous expansion of the retina; that the choroides, in this place, was very subtile, discoloured, and destitute of its usual reticulated vascularity; and that, in particular, the sclerotica was so much thinned in the situation of the staphyloma, that it was hardly as thick as a sheet of writing-paper. Scarpa learnt, that the woman, from whose body this eye was taken, had some years previously lost the power of seeing with this organ, during the prevalence of an obstinate ophthalmy, attended with habitual and excruciating head-achs.

Scarpa had an opportunity of observing a similar disease of an eye, accidentally taken from the body of a woman, thirty-five years of age. It was sent to him from Milan, by Doctor Monteggia. It was of an oval shape, and larger, than its fellow. The staphyloma of the sclerotica was situated on its posterior hemisphere, on the outside of the entrance of the optic nerve, in other words, towards the temple. The vitreous humour was converted into water, the capsule of the crystalline was very turgid, with a limpid, whitish fluid; the lens was yellowish, and smaller, than natural; in the interior of the staphyloma of the sclerotica, the retina was wanting; the sclerotica itself, and the choroides were elevated in the form of a tumour, and rendered so thin, that the light passed through them. Scarpa could not learn any thing concerning the state of this woman's sight; but, in regard to the disease, he much doubts, whether art will ever succeed in administering efficacious means for the stoppage of its progress, much less for its cure.

But, to return to the staphyloma of the transparent cornea, this part of the eyeball being, in this circumstance, affected with an irremediable opacity. Scarpa remarks, that the surgeon can have no other aim in the treatment of this disease, when it is recent in children of ten years, but to hinder the increase of the swelling of the cornea, the organization of which membrane is already destroyed. The tumour must be levelled, and flattened as much as possible; and when the swelling of the cornea is inveterate, very large, and prominent beyond the eyelids, it is to be diminished by surgical means, so as to return within the orbit, sufficiently to permit the deformity of the face to be amended by the application of an artificial eye.

Richter proposes, in cases of recent staphyloma, to make at the bottom of the tumour of the cornea an artificial ulcer, by repeatedly applying the argentum nitratum, or the oxygenated muriate of antimony (butter of antimony), and to keep it open by the continued use of the same caustic, with a view of effecting by means of this little issue, the dispersion of the gross tenacious humour, which is the immediate cause of the preternatural opacity, and swelling of the cornea. The author assures us, says Scarpa, that, in this way, he has many times effected a diminution of the staphyloma, and, in one particular case, even restored the transparency of the cornea. This cure has always seemed to Scarpa the most rare, and surprising, of all, that are recorded on the subject of diseases of the eyes; the more so, as this success was obtained in the space of fourteen days. *Ter repetitâ operàtione, quarto scilicet, septimo et decimo die, ne vestigium quidem morbi die decimo-quarto superarat. Obs. Chir. Fasciculus* 2.

Scarpa declares, that though he has frequently attempted to cure the recent staphyloma, in infants, by the above method of making an issue, and this with the greatest confidence of success, and in the persuasion, that this plan of cure was founded on certain, and obvious premises, respecting the nature of the disease, when it is recent, and in children of tender years; though, in doing so, he had for imitation a master in surgery of the highest authority; he has never yet met with such success, as can be at all compared with Richter's either in restoring the transparency of the cornea, or accomplishing a diminution of the volume of the staphyloma. Having formed with the argentum nitratum a small ulcer, at the bottom of the cornea, and kept the sore open thirty days and more, he failed in obtaining any benefit, in respect to the diminution, much less the opacity of the cornea, in three infants, one a year and a half old, and the two others somewhat more than three, all which subjects had been recently attacked with staphyloma in one eye, in consequence of the small-pox. A violent chemosis, in a very short time, produced a staphyloma in the eye of a child, five years old. Scarpa made an ulcer at the bottom of the cornea, in the unorganized, swollen substance of which he introduced, for a little depth, the flat part of a lancet. Scarpa kept the sore open, for five weeks, with a solution of the argentum nitratum, and he remarked, that the staphyloma became somewhat flatter, so as to lose the acute prominence, which it had at its centre; but the cornea continued as before, every where opaque. Though Scarpa employed the same method in two other subjects, of about the same age, and in the same circumstances; though he kept the ulcer open fifty days, he was never able to effect any depression or diminution of the staphyloma; and, consequently, the pointed, pearl-coloured, projecting part of the tumour continued in the same state as it was before. Scarpa states, that the conical shape, which the cornea assumes in this disease, is a characteristic symptom, by which a staphyloma may be distinguished from the leucoma, with total opacity of the cornea.

If, also, in the course of further trials, partial benefit be found to accrue from this plan, adopted not for the purpose of re-establishing the transparency of the cornea, but for that of merely checking, and diminishing the recent staphyloma in infants, still Scarpa is of opinion, that no one will be easily persuaded, that the same treatment can ever prove of the least service, in diminishing the size of the large, inveterate, staphyloma in adults; in other words, of that, which projects beyond the eyelids, and rests on the cheek. What advantage can be expected from an artificial ulcer, formed in the substance of the cornea, no longer soft and pulpy, nor merely thickened by a viscid matter, effused in the interstices of its texture, but become dry and coriaceous from time, protruding in consequence of the excessive distention from within outward, and covered with a callous crust, consisting of the layer of the conjunctiva, and its varicous vessels? Certain it is, says Scarpa, that as often as it has happened, that the inveterate staphyloma, protruding out of the eyelids, has accidentally ulcerated from the irritation of any extraneous body, the tears, or long pressure of the parts, on which it rests, the ulcer has never been seen to effect a diminution of the disease; we even read, that the ancient staphyloma, under such circumstances, has often degenerated into a malignant fungus.

Hence, Scarpa observes, that in the highest stage of this disease, when the staphyloma projects beyond the eyelids, art has, at present, no more effectual means for restraining the progress of the complaint, and removing the deformity, than cutting away the staphyloma, and when the place is healed, applying an artificial eye.

Celsus thus expresses himself on the subject of this operation: *Curatio duplex est. Altera ad ipsas radices per medium transuere acu, duo lina ducente, deinde alterius lini duo capita ex superiore parte, alterius ex inferiore adstringere inter se quæ paulatim secando id excidant. Altera in summâ parte ejus ad lenticulæ magnitudinem excindere; deinde spodium, aut cadmiam infricare. Utrolibet autem facto, album ovi lana excipiendum, et imponendum; posteaque vapore aquæ calidæ fovendus oculus, et lenibus medicamentis unguendus est.* De Medicina, lib. 7. cap. 7.

Though, says Scarpa, the first plan or that of the ligature, is at present abandoned, as being generally thought the least appropriate; the majority of surgeons still persevere in passing a needle and ligature, through the lower part of the staphyloma, not for the purpose of tying, or constricting the tumour, it is true, but of making a noose, in order to fix the eye conveniently, when the staphyloma is to be cut off in a circular manner. But Scarpa proves, that the same advantage may be obtained by a very simple method, which is more expeditious, and less incommodious to the patient, and, he is therefore persuaded that the apparatus of the needle and ligature will very soon be disused, both as a means of cure, and an auxiliary in the operation.

With regard to the second method of

removing the staphyloma, or that of excision, Scarpa thinks, that sufficient attention has not hitherto been paid to what Celsus has written on this subject. In fact, Celsus does not forbid cutting away the staphyloma, by a circular incision at its base, as is practised at the present day, but says, that this operation is to be done in the centre, or conical point of the tumour, and that as much of this part of the staphyloma is to be cut away, as will equal a lentil in size: *In summâ parte ejus ad lenticulæ magnitudinem excindere.* Scarpa remarks, that the great importance of this precept of Celsus in regard to the successful treatment of the staphyloma, can only be duly appreciated by such as have often had occasion to compare the advantages of Celsus's doctrine, with the serious inconveniences, which result from the common practice of cutting away the staphyloma circularly at its base; and with the evils produced by a semicircular section, comprehending the sclerotica, in Woolhouse's manner, always followed by acute inflammation of the eyeball and eyelids, violent pains in the head, restlessness, spasms, copious and sometimes gangrenous suppurations of the eye and eyelids. To Scarpa it is a matter of fact, proved by a numerous series of observations, that, the more the semi-circular recision of the staphyloma is distant from the centre or apex of the tumour, approximating its base, and advancing towards the sclerotica, the more aggravated are the symptoms consequent to this operation; *& vice versâ.*

The following is Scarpa's method of effecting the destruction of the inveterate staphyloma, protruding out of the eyelids. The patient being seated, Scarpa directs an assistant to support his head properly; then taking in his hand a knife, similar to what is used in the extraction of the cataract, he passes the instrument completely across the staphyloma, at the distance of one line and a half, or two lines, from the centre or apex of the tumour, from the external towards the internal angle of the eye, and, by passing the knife forward in the same direction, just as is done in the extraction of the cataract, he makes a semicircular incision downwards, in the most prominent part of the tumour. Having done this, he takes hold of the segment of the staphyloma with the forceps, and turning the edge of the knife upward, he completes the circular recision of the apex of the tumour, in such a way, that the detached portion is one, two, three, or four lines in diameter, according to the size of the staphyloma. As a portion of the iris, adhering to the cornea, from the very commencement of the disease, is commonly included in this section of the pointed part of the tumour, no sooner is the circular division of the apex of the staphyloma made, than the crystalline, or its nucleus, issues from the eye, followed by a portion of the dissolved vitreous humour. In consequence of this evacuation, continues Scarpa, the eye-ball often diminishes in such a degree, that it can be covered by the eyelids, to which Scarpa immediately applies a pledget of dry lint, supported by a retentive bandage.

The pain, produced by this section, is of the smallest consequence, and it is common to see patients perfectly tranquil, the three, or four first days after the operation. The eye and eyelids most frequently begin to be painful, inflame, and swell, on the fourth day. On the appearance of these symptoms, which ordinarily are very mild, the eye, on which the operation has been done, is to be covered with a bread and milk poultice, in order to promote and accelerate the suppuration of the internal membranes of the eye. When things proceed in a regular manner, the tumefaction of the eyelids subsides about the seventh, or ninth day, and purulent matter is seen on the poultice, blended with the dissolved vitreous humour, which slowly issues from the bottom of the eye. The matter afterwards becomes thick, and whitish, with relief to the patient, and manifest diminution of the whole eye-ball, which not only shrinks within the eyelids, but even sinks into the orbit.

At this period, observes Scarpa, on gently separating the eyelids, the conjunctiva is found swollen, and reddish, and the margin of the wound of the staphyloma seems like a whitish circle. When the detachment of this gelatinous circle takes place, which usually is on the twelfth or fourteenth day after the operation, the edge of the surface, from which the staphyloma was cut, becomes red, contracts, and daily diminishes, so that, at last, the wound is entirely closed. There only remains in the centre of the cornea, for a few days, a small fleshy prominence resembling a little reddish papilla, which, after being touched a few times with the argentum nitratum, contracts, and becomes completely healed.

So far, says Scarpa, are alarming symptoms from following this operation, that in a great number of cases, the surgeon is even obliged, several days afterwards, to stimulate the eye, on which it has been performed, in order to make it inflame, partly by leaving it a long while uncovered, and exposed to the air, partly by enlarging the circular recision made in the centre of the staphyloma, of which another circular portion, half a line broad, is removed, in order to facilitate the more abundant discharge of the humours, and the ingress of air into the cavities of the eye, which are so backward to inflame. As soon as inflammation has invaded the interiour of the eye, and suppuration has taken place, the rest of the cure regularly follows under the use of topical emollients, and is soon completed with all possible mildness. As by putting into execution the above method of destroying the staphyloma, the consequent shrinking of the eye-ball takes place equally around the great axis of this organ, the stump, which follows, has also a regular circumference, and presents an easy, and commodious place for the application of an artificial eye. (*Scarpa sulle Malattie degli Occhi.*)

Wenzel and numerous other writers, imply by staphyloma, a protrusion of a piece of the iris, through a wound or ulcer of the eye. See *Iris, Prolapsus of.*

Consult also *G. J. Beer's Ansicht der Staphylomatösen Metamorphosen des Auges, &c. Wien*, 1805. *Delpech, Précis Elémentaire des Maladies Reputées Chirurgicales, Tom.* 3, *p.* 294, *&c. Paris*, 1816. *Callisen, Systema Chirurgiæ Hodiernæ; Vol.* 2, *p.* 166, *&c.; Hafniæ* 1800. *Richter, Anfangsgründe der Wundarzneykunst, Band* 3, *p.* 153, *&c. Göttingen*, 1795. *Sabatier's Médecine Operatoire, Tom.* 2, *p.* 191. *Edit. of* 1810.

STEATOMA. (from *στεαρ*, fat.) A wen, or encysted tumour, containing fat. See *Tumours, Encysted.*

STELLA, or STELLATED BANDAGE. A bandage so named because it makes a cross, or star on the back. It is a roller, applied in the manner of the figure 8, so as to keep back the shoulders. It is often employed in cases of fractures, and dislocations of the clavicle.

STRICTURE. (from *stringo*, to bind.) A diminution, or contracted state of some tube, or duct in the body. See *Urethra, Strictures of; Œsophagus, &c. Rectum, &c.* Stricture also means, in cases of strangulated hernia, the narrowest part of the opening, or passage through which the bowels protrude, which narrowest part makes on the viscera the pressure causing all the bad symptoms. See *Hernia.*

STRUMA. (from *struo*, to heap up.) Scrofula, or Scrophula. The King's Evil. See *Scrophula.*

STYE. A little inflammatory tumour on the eyelid. See *Hordeolum.*

SUPPRESSION OF URINE. See *Urine, Retention of.*

SUPPURATION. A process, by which a peculiar fluid, termed *pus*, is formed in the substance, or from the surface, of parts of the body.

The article *inflammation* made us understand, that inflammation, when it exceeds a certain pitch, sometimes terminates in suppuration.

When the purulent matter accumulates in the part affected, it is termed an *abscess*, which is distinguished into several kinds, the *acute, chronic, venereal, scrophulous*, &c.

It is observed by Professor Thomson, that the texture, in which suppuration seems to be most readily produced, by a certain degree of inflammation, is mucous membrane, whether this lines excretory ducts, or canals, or covers the inner surfaces of the respiratory, or urinary organs. In a few hours, after an irritating cause has been applied to these surfaces, the physical and chemical qualities of the fluid, which they secrete in their natural state, are changed. From being a tough viscid substance, not easily miscible with water, the mucus of the nose and bronchia becomes, during an attack of inflammation, very readily miscible with water, of a yellowish white colour, and fluid consistence. If, in this state, the secretion from these membranes be examined with the microscope, it will be found to contain small globules, similar to those which are seen in the blood; and these globules are found to increase in number in proportion to the degree and continuance of the inflammation. We have examples of the production of this pus, or at least of a puriform fluid, in the respiratory organs of persons affected with catarrh, and in the urinary organs of those, who labour under gonorrhœa. In the progress of these diseases, we can generally trace the changes, which take place by slow, but sensible degrees, in the nature of the secretion, from mucus to pus, and from pus back again to the state of mucus. This puriform discharge from mucous membranes, in a state of inflammation, may be kept up for months without these membranes appearing to undergo any other morbid changes, than a slight degree of redness and swelling. A loss of substance, or ulceration, is found not to happen oftener than in one case, out of ten examples of suppuration from mucous membranes. (*Thomson's Lectures on Inflammation, p.* 305—306.)

The same well informed writer afterwards proceeds to explain, that suppuration may be readily produced in the skin, or cutaneous texture, by whatever excites inflammation in that texture, and causes a separation of the cuticle. We have examples of this in blisters from cantharides, and in vesications of the cuticle from superficial burns. If the cuticle, covering a recent blister, or burn, be removed, and the cutis exposed to the irritation of stimulating substances, pus will soon be discharged from the abraded surface. Suppuration can be kept up in cutaneous texture for an indefinite length of time, as we see done every day in the management of perpetual blisters. Ulceration is seldom observed in these cases, and, consequently, in cutaneous texture, loss of substance is by no means necessary for the production of pus.

If the cutis be divided, as in a wound, or a portion of it removed, as in the extirpation of tumours, and either the air, or any other external body, be permitted to remain in contact with the divided surfaces, the process of suppuration is speedily induced in the cellular texture subjacent to the skin. After the hemorrhage, which takes place from the small vessels, has ceased, an oozing of a fluid, at first resembling serum, occurs, which is gradually changed into pus. But, in this case, as Dr. Thomson has correctly observed, the surface of the wound is previously covered with a layer of coagulable lymph, which is penetratedwith blood-vessels, and gradually raised into the little red eminences, termed granulations.

Appearances similar, though slighter in degree, says Dr. Thomson, are observed in cutaneous suppuration, giving probability to the opinion of Sir E. Home, that, in inflammation, a vascular surface is produced previously to the formation of pus in cellular membrane, and perhaps also in cutaneous texture. Dr. Thomson is inclined to believe, however, that no new vascular surface is generated in the inflammation of mucous membrane. Thus, we see, that in the formation of pus in mucous membrane, cutaneous texture, and exposed cellular substance, no ulceration, no breach of substance occurs; but that, on the contrary, in two of these textures, the cutaneous and cellular, there is an addition made to the parts by the exudation of coagulable lymph, which becomes organized. (*Thomson, p.* 305—308.)

### SYMPTOMS OF SUPPURATION.

When matter is fully formed in a tumour, there is a remission of all the symptoms. The throbbing pain, which was before frequent, now goes off, and the patient complains of a more dull, constant, heavy pain. A conical eminence, or *pointing*, as it is termed, takes place at some particular part of the tumour, generally near its middle. In this situation, a whitish, or yellowish appearance is generally observable, instead of a deep red, which was previously apparent, and a fluctuation of a fluid underneath may be discovered, on a careful examination with the fingers. Sometimes, indeed, when an abscess is thickly covered with muscles and other parts, the fluctuation cannot be easily distinguished, though, from other concurring circumstances, there can hardly be the least doubt of there being even a very considerable collection of matter. An œdematous swelling over the situation of deeply situated abscesses is a symptom, which often occurs, and is well worthy the attention of every practical surgeon.

The discovery of the existence of deep abscesses is a circumstance of the highest importance in practice, and one which greatly involves the practitioner's reputation. In no part of the surgeon's employment is experience, in former similar cases, of greater use to him, than in the present; and however simple it may appear, yet nothing, it is certain, more readily distinguishes a man of observation and extensive practice, than his being able easily to detect collections of deep-seated matter. On the contrary, nothing so materially injures the character and professional credit of a surgeon, as his having in such cases given an inaccurate or unjust prognosis; for, in disorders of this kind, the nature and event of the case are generally at last clearly demonstrated to all concerned.

Together with the several local symptoms of the presence of pus, already enumerated, may be mentioned the frequent shiverings, to which patients are liable on its first formation. However, these rigors seldom occur so as to be distinctly observed, unless the collection of matter is considerable, or situated internally in some of the viscera.

"In the progress of the fever, accompanying acute inflammation, (says Professor Thomson) rigors, or cold shiverings not unfrequently take place, which recur at irregular intervals, and are in general followed by a hot fit, and slight increase of the febrile symptoms. These rigors, or cold shiverings, in general indicate, when they occur in the progress of inflammatory diseases, that pus either is formed, or is about to be so. In inflammation, succeeding to injuries of the head, these rigors are often the first constitutional symptoms which give alarm to the well informed practitioner; for, they are generally, though not always, an indication, that inflammation has already made a dangerous, if not fatal, progress. These rigors also accompany the formation of pus in the viscera contained within the cavities of the chest and belly, and are often the first symptoms, which inform the practitioner, that his endeavours to procure resolution have not been successful." (See *Thomson's Lectures on Inflammation, p.* 321.)

Rigors, as Mr. Hunter remarked, are more common at the commencement of spontaneous inflammations, than in inflammations from external injury. They seldom occur in the suppurations, which follow operations.

The constitutional symptoms, which attend the formation of pus in the progress of chronic suppurations, are generally comprehended under the name of hectic fever. (See *Fevers.*)

The pain, attending what Mr. Hunter termed the suppurative inflammation, is increased at the time when the arteries are dilated, and this gives the sensation called throbbing, in which every one can count his own pulse, by merely paying attention to the inflamed part. Perhaps, this last symptom is one of the best characteristics of this species of inflammation. When the inflammation is moving from the adhesive state to the suppurative, the pain is considerably increased; but, when suppuration has taken place, the pain in some degree subsides. (*Hunter.*)

The redness that took place in the adhesive stage is now increased, and is of a pale scarlet colour. The part, which was firm, hard, and swelled, in the previous stage of the inflammation, now becomes still more swelled, in consequence of the greater dilatation of the vessels, and the greater quantity of coagulating lymph thrown out. (*Hunter.*)

### THEORY OF SUPPURATION.

The dissolution of the living solids of an animal body into pus, and the power of this fluid to continue the dissolution, are opinions, which are no longer entertained by any well informed surgeons of the present day; and the use of such phrases as "*pus corrodes*," "*it is acrid*," &c. expressions, which imply an erroneous way of thinking, is very properly almost entirely discontinued in the language of every sensible medical man. If these notions were true, no sore, which discharges matter, could be exempted from a continual dissolution. Such ideas probably arose from the circumstance of an abscess being a hollow cavity in the solids, and from the supposition, that the whole of the original substance of this cavity was now the matter, which was found in it. This was a very natural way of accounting for the formation of pus by one entirely ignorant of the moving juices, the powers of the arteries, and what takes place in an abscess after it is opened. The knowledge of these three subjects, abstracted from the knowledge of the abscess before its being opened, should have led surgeons to account for the formation of pus from the blood by the powers of the arteries alone. According to the above erroneous principle, abscesses would continue to increase after being opened, as fast as before. Upon the principle of the solids being dissolved into pus, was founded the practice of bringing all indurated parts to suppuration, if possible, and not making an early opening. This was done for the purpose of giving time for the solids to melt down into pus; but, it was apparently forgotten, that abscesses formed matter after they were opened, and, therefore, the parts stood the same chance of dissolution into pus as before. Blinded with the idea, that the solids entered into the composition of pus, the partisans of this doctrine could never see pus flowing from any internal canal, as from the urethra, in cases of gonorrhœa, without supposing the existence of an ulcer in the passage. Such sentiments might be forgiven, before it was known, that these surfaces could, and generally did, form pus, without a breach of the solids; but, the continuance of this way of thinking now is not mere ignorance, but stupidity. The formation of pints of matter in the cavities of the chest, and abdomen, without any breach in the solids, could not have been overlooked by the most zealous advocates for the doctrine of dissolution. (*Hunter.*)

The moderns have been still more ridiculous; for, knowing, that it was denied, that the solids were ever dissolved into pus, and that there was not a single proof of it, they have been busy in producing what to them seemed a proof. They have been putting dead animal matter into abscesses, and, finding, that it was either wholly, or in part dissolved, they, therefore, attributed the loss to its being formed into pus. This, however, was putting living and dead animal matter upon the same footing, which is a contradiction in itself; for, if the result of this experiment were really what they supposed it to be, the idea of living parts being dissolved into pus must be abandoned, because living and dead animal matter can never be considered in the same light. (*Hunter.*)

It might have been remarked, that even extraneous animal matter would lie in abscesses for a considerable time, without being dissolved, and, that in abscesses arising, either from violence, or from a species of erysipelatous inflammation, there were often sloughs of the cellular membrane, which sloughs would come away, like wet tow, and, therefore, were not dissolved into pus. (*Hunter.*)

It might also have been noticed, that in abscesses in tendinous parts, as about the ankle, a tendon often mortified, and sloughed away, and that the sores would not heal till such sloughs were detached; but though this separation was sometimes not completed, before the expiration of months, yet the sloughs at last were thrown off, and consequently could not be converted into pus. Pieces of dead bone often lie soaking in matter for many months, without being changed into pus; and although bones, so circumstanced, may lose a considerable deal of their substance, a loss which some might impute to the dissolution of the bone into pus, yet, that waste can be accounted for and proved on the principle of absorption. The loss is always upon that surface, upon which the continuity is broken off, and it is a part of the process by which exfoliation of a dead piece of bone is accomplished. The formation of pus has been attributed to a kind of fermentation, in which both the solids and fluids were concerned. This doctrine is easily refuted by stating what happens in internal canals, which naturally secrete mucus, but frequently form pus, without any loss of substance, or any previous fermenting process. Were we to suppose a fermentation of the solids and fluids the immediate cause of the production of pus, whence could the solids come, which enter into the composition of discharges from the urethra? for the whole penis could not afford matter enough to form the pus, which is discharged in a common gonorrhœa. How also could the fermentation of the solids ever cease? for, there is the same surface secreting its mucus, whenever the formation of pus is discontinued. It may be asked, likewise, by what power the first particle of pus in an abscess, or on a sore, is formed, before there is any particle existing, which is capable of dissolving the solids? An abscess may be stationary for months, and at last be absorbed; what becomes of the fermentation all the while the collection of matter continues stationary?

Extravasated blood has been supposed to be capable of being converted into pus. We find, however, that blood, when extravasated, either from violence, or a rupture of a vessel, as in an aneurism, never of itself becomes pus; nor was pus ever formed in these cases, without being preceded by inflammation. Both the blood and matter are also found together in the same cavity, under such circumstances. If the blood had coagulated, which it seldom does in cases of violence, it would be found still coagulated; and if it had not coagulated, the pus would be bloody.—(*Hunter.*)

The modern theory of suppuration is, that the matter is separated from the blood by the secreting power of the vessels of the inflamed part, which now acquire a new mode of action.

That pus is formed in the vessels, from which it exudes, by an action of these vessels analogous to secretion, was, so far as I know (says Professor Thomson) first distinctly suggested by Dr. Simpson of St. Andrew's, in his "*Dissertationes de Re Medica,*" published in the year 1722. An opinion, similar to that of Dr. Simpson's suggested itself, about the year 1756, to De Haen, from the consideration of what takes place in some cases of phthisis pulmonalis. This author observes, that pus was often expectorated, for a great length of time, by patients affected with phthisis, in whom, after death, no mark of ulceration could be perceived, not even the place in which the pus had been formed. The hypothesis of pus being a secretion was afterwards more fully considered by Dr. Morgan, of Philadelphia, in his inaugural thesis printed at Edinburgh in 1763, entitled "*Puopoieses, sive Tentamen Medicum de Puris Confectione.*" The belief, that pus is a secretion, or formed at least by an action of the vessels analogous to secretion, was adopted by Mr. Hunter. Indeed, the merit of the original suggestion of this hypothesis has been ascribed to him, though improperly. Bruggman, professor of botany at Leyden, has maintained the same doctrine in an excellent thesis "*De Puogenia,*" published in 1785; and it is that which is now very generally taught all over Europe. (See *Thomson's Lectures on Inflammation, p.* 316—317.)

The opinion, that suppuration is a process, analogous to glandular secretion, was at first hastily rejected by many, who were swayed by the fact, that there is no pus ever found blended with the blood in the circulating system. By this mode of reasoning, however, such thinkers must be led to deny the universally received and undoubted doctrine, that the bile is a secretion; and, yet, it is well known, that nothing like this fluid can be detected in an analysis of the blood, and, indeed, a very small quantity would be sufficient to tinge the whole mass of circulating blood with a yellow colour, the same as we see in cases of jaundice. No one would wish to defend the idea of there being either pus, or bile, actually in the circulation; but, only the matter, or modifications of the matter, which, by the combinations, or whatever changes, we may choose to term them, taking place in the secreting vessels, and by their operations are converted into one of the particular fluids in question.

No suppuration ever takes places without being preceded by inflammation; no pus is ever formed but in consequence of it. In abscesses, a suppuration is an immediate effect of inflammation; and when internal cavities remain exposed, no suppuration comes on, till inflammation has formed the disposition and action.

Violence done to parts is one of the great causes of suppuration; but, simply, violence does not always occasion it. The violence must be followed by a prevention of a cure in a more simple way, viz. by a restoration of the structure, so as to carry on the animal functions of the part. The parts must be kept long enough in that state into which they were put by the violence. Or, what is somewhat similar to this, the violence must be attended with death in a part, as, in many bruises, all mortifications and all sloughs, in consequence of the application of caustic, which, when the dead parts separate, leave internal surfaces exposed. (*Hunter.*)

As every injury, or effect of outward violence, under the above circumstances, is more or less exposed to the surrounding air, the application of air to internal surfaces has been assigned as a cause of suppuration; but, certainly, the air has not the least effect on parts, circumstanced as above, for a stimulus would arise from a wound, were it even contained in a vacuum. In circumscribed abscesses, the air cannot possibly get to the parts, so as to have any share in making them suppurate.

In cases of emphysema, when the air is diffused over the whole body, no suppuration is the consequence, unless an exposure, or imperfection of some internal surface should be made, for the purpose of allowing the air to escape. A stronger proof, that it is not the admission of air, which makes parts inflame, is, that the cells in the soft parts of birds, and many of the cells and canals of their bones, communicating with the lungs, and always containing air, never inflame; but if these cells are exposed in an unnatural way, then the stimulus of imperfection is given, these cavities then inflame, and their surfaces either form adhesions together, or produce pus. (*Hunter.*)

When the interior of an abscess is examined, the cavity, which contained the matter, is observed to be lined with a smooth, membranous-looking substance, which is of a whitish ash-colour, and has a strong resemblance to coagulating lymph. This membrane-like substance has been termed the *sac*, or *cyst* of the abscess. This sac, or cyst, seems in general to adhere by a vascular union to the surrounding cellular membrane, which is itself likewise denser in texture, and more vascular, than in the natural state, (*Thomson's Lectures, p.* 310.) its cells being closed by coagulating lymph, effused in consequence of that species of inflammation, which Mr. Hunter termed the adhesive. Thus by the formation of a cyst, and the effusion of coagulating lymph in the cellular substance around the abscess, the collection of matter is bounded, and cannot become diffused, as it otherwise would do, in the communicating cavities of the cellular membrane, like the water in œdema.

Something, like this diffusion of pus, seems to occur in erysipelas phlegmonoides. "But, in this case, (says Professor Thomson) the vitality of greater, or less portions of the cellular substance is destroyed, the deadened portions are converted into dirty, whitish, ash-coloured sloughs, and it becomes extremely difficult to say, whether any part of the pus contained in the deadened cellular membrane has been formed in the cells, in which it is contained, or has been absorbed into these cells, after being separated from the parietes of the cavities containing the sloughs themselves." (*Lectures, &c. p.* 310.)

There can be no doubt, that, after an abscess has received a membranous lining, or cyst, the secretion of pus is continued from the surface of the latter part entirely, as well as whatever degree of absorption of the same fluid happens to be going on. In fact, the cysts must be both secreting and absorbing surfaces. The circumstances which leave no doubt of this point, are the frequent sudden or gradual removal of very large manifest collections of matter; the continual changes occurring in the quantity and consistence of the pus; and the speedy filling of the cavity with purulent matter again after the first contents of the abscess have been discharged.

Another thing, which is yet a subject of controversy, is, whether suppuration ever happens unpreceded by inflammation? Professor Thomson, of Edinburgh, believes, that the affirmative opinion on this point was first suggested by De Haen, of Vienna; but, he thinks, that much of the difference of sentiment in this matter has proceeded from the vague "notions, entertained with regard to the symptoms, which necessarily characterise the state of inflammation, and also with regard to the properties, by which pus is to be distinguished from other animal fluids. Accordingly, in almost all the examples, which De Haen has adduced to prove the formation of pus, without the previous existence of inflammation, he has himself occasion to remark the exudation of coagulating lymph, and the existence of preternatural adhesions; phenomena, which we now know are produced by that state, which Mr. Hunter has denominated adhesive inflammation." But, De Haen uses the term inflammation to express that state, which we denominate ulceration, or ulcerative absorption; for, in speaking of the cases of suppuration, which he has adduced, he observes, that, "in many of them no previous loss, or consumption of substance could be perceived." An observation, similar to this, was made about the same time, or perhaps a little earlier, by Dr. William Hunter, and an account given of it in the second volume of the London Medical Observations and Inquiries.

"Mr. Hunter, though he endeavours to establish it as an invariable fact, that no suppuration takes place, which is not preceded by inflammation, is of opinion, that collections of what he terms extraneous matter, something like pus, may form in various parts of the body, without the previous existence of inflammation in the parts, in which it is formed; and accordingly you will find, at page 390 of his Treatise on Inflammation, a chapter entitled, "Of Collections of Matter without Inflammation."

Professor Thomson doubts, however, "whether these collections of matter, said to be formed without inflammation, would not have been more properly denominated scrophulous abscesses, or chronic suppurations. I am disposed to believe (says he), that, in whatever texture, or organ of the body, scrophula manifests itself, there inflammation will be found to exist. The phenomena, it is true, of inflammation, both local and constitutional, are modified by the existence of the scrophulous diathesis; but, they are, I believe, always present in such a degree as to justify us in giving to them the name of inflammation, and in classing most, if not all local scrophulous affections, among inflammatory diseases. When the indolent swellings, of which Mr. Hunter speaks, occur near to the surface of the body, that part feels warmer, than usual, as may be felt in white-swellings of the joints. The swelling also is either preceded or accompanied with some degree of pain, though, when the affection is internal, the patient may not always be very accurate with regard to the precise seat of this pain. When cut into, the parts also affected with scrophulous swellings are always found more vascular, than usual; in short, all the symptoms occur by which the state of inflammation is characterised." (See *Thomson's Lectures on Inflammation, p.* 313—314.) In another place, this author admits, that the matter, which as formed in chronic suppurations, does not always accurately resemble that, which is formed in acute abscesses; but, yet he contends, that it is so analogous both in its physical and chemical characters, as well as in the circumstances, in which it is produced, that he can see no reason, why it should not be called pus, or a puriform fluid. (*P.* 315.)

### QUALITIES OF PUS.

True pus has certain properties, which when taken singly, may belong to other secretions, but, which, conjointly, form the peculiar character of this fluid, viz. globules swimming in a fluid, which is coagulable by a solution of the muriate of ammonia, which no other animal secretion is, and, at the same time, a consequence of inflammation.

The colour and the consistence of pus are the two qualities which first attract the notice of every, the most superficial observer. The colour arises from the largest portion of this fluid being composed of very small round bodies, very much like those little globules, which, swimming in a fluid, make cream. The fluid, in which the globules of pus swim, we might at first suppose to be the serum of the blood, for it coagulates with heat, like the latter fluid. Pus is also probably mixed with a small quantity of coagulating lymph; as it partly coagulates, after it is secreted.

The fluid part of pus, however, is known to have properties, which serum has not. There being a similarity between pus and milk, experiments have been made to ascertain whether the fluid of pus could be coagulated with the gastric juice of animals; but, no coagulation could be effected in this manner; a solution of muriate of ammonia made the fluid part of pus coagulate; but, not any other secretion, or natural fluid; and, hence, it was concluded, that whenever globules were found swimming in a fluid, coagulable by muriate of ammonia, the matter was to be considered as pus. (*Hunter.*)

The proportion, which the white globules bear to the other parts of pus, depends on the health of the parts producing the discharge. When the globules are very abundant, the matter is thicker and whiter, and is called healthy pus; the meaning of which is, that the solids, which produced it, are in good health; for, these appearances in the matter are no more, than the result of certain salutary processes going on in the solids, the effect of which processes is to produce the disposition, on which both suppuration and granulation depend. (*Hunter.*)

Pus is specifically heavier than water, and is probably about as heavy as blood.

Besides the above properties, pus has a sweetish mawkish taste, very different from that of most other secretions, and the same taste takes place, whether it is pus from a sore, or an irritated inflamed surface.

Pus has a smell, in some degree peculiar to itself; but this differs in different cases. Some diseases, it is said, may be known by the smell, as for instance, a gonorrhœa.

Pus sinks in water; mucus floats. Pus communicates to water an uniformly troubled white colour; mucus gives the appearance of stringy portions floating in it. Mucus is said to be more readily dissolved by sulphuric acid, than pus is. It has also been asserted, that if water be added to such solutions, the pus is precipitated to the bottom of the vessel; while the mucus, instead of being completely precipitated, forms swimming flakes. A solution of caustic alkali dissolves both pus and mucus; but, when water is added, the pus is said to become separated, but not the mucus.

Though solutions in chemical menstrua and precipitations, have been thought a test of the distinction, between these two fluids; yet, the method has been thought absurd and unphilosophical. It has been conceived, that all animal substances whatever, when in solution, either in acids or alkalies, would be in the same state, and therefore, that the precipitation would be the same in all. Calcareous earth, when dissolved in muriatic acid, is in that acid in the same state, whether it has been dissolved from chalk, limestone, marble, or calcareous spar, and precipitations from all are the same. Hence, experiments were made on organic, animal matter, such as muscle, tendon, cartilage, liver, and brain;

and on inorganic, such as pus and the white of an egg. All these substances were dissolved in sulphuric acid, and precipitated with the vegetable alkali. Each precipitation was examined with such magnifiers, as plainly shewed the forms of the precipitates, all which appeared to be flaky substances. The precipitate by the volatile alkali had exactly the same appearance. The same appearances were seen, when the above kinds of animal matter were dissolved in the vegetable caustic alkali, and precipitated with the muriatic acid. A flaky substance, void of any regular form, composed each precipitate. (*Hunter.*)

Pus does not irritate the particular surface, which secretes it, though it may be very irritating to any other. Hence, no suppurating surface of any specific kind, can be kept up by its own matter. If this had not been the case, no sore of a specific quality, or producing matter of an irritating kind, could ever have been healed. This is similar to every other secretion of stimulating fluids, as the bile, tears, &c. which fluids do not stimulate their own glands, or ducts, but are capable of stimulating any other part of the body. (*Hunter.*)

Whenever a real disease attacks, either the suppurating surface, or the constitution, the production of true pus ceases, and the fluid becomes changed in some measure, in proportion to these morbid alterations. In general it becomes thinner and more transparent, and it partakes more of the nature of the blood, as is the case in most other secretions under similar circumstances. *Sanies* is the term usually applied by surgeons, to pus, in this degenerated state. This unhealthy sort of matter has more of the serum, and, frequently, more of the coagulating lymph in it, and less of the combination, which renders it coagulable by a solution of muriate of ammonia. It has also a greater proportion of the extraneous parts of the blood, which are soluble in water, such as salts; and it has a greater tendency, than true pus, to become putrid. Such unhealthy matter may even be irritating to the surface, which produces it.

The discharge, when of an irritating sort, is more stimulating to the adjoining parts with which it comes in contact, than to its own secreting surface. In this manner, it frequently produces excoriation of the skin, and ulceration. Thus the tears excoriate the skin of the cheek, in consequence of the quantity of salts, which they contain. From this effect, matter has been called corrosive, a quality, which it has not; the only property which it possesses, being that of irritating the parts, which it touches, so as to cause their absorption. (*Hunter.*)

When the vessels thus lose the power of producing good pus, they also lose more or less the power of forming granulations. This may depend on some deviation from the due structure, and action, which such vessels should possess, in order to be qualified for the performance of these two operations.

Pus, from several circumstances, would appear in general to have a greater tendency to putrefaction, than the natural juices have; but, perhaps, this is not the case with pure pus, which, when first discharged from an abscess, is commonly perfectly sweet. There are, however, some exceptions to this, but these depend on circumstances entirely foreign to the nature of pus itself. Thus, if the abscess had any communication with the air, while the matter was confined in it; or if the collection has been so near the colon, or rectum, as to have been infected by the feces, then we cannot wonder, that the matter should become putrid. When blood is blended with pus; when sloughs are mixed with it; when the parts forming the seat of the abscess, are in a gangrenous state from an erysipelatous affection; the matter has a greater tendency to putrefy, than the pure pus, discharged from sound abscesses, or healing sores. Pure matter, though easily rendered susceptible of change, by extraneous additions, is in its own nature tolerably uniform and immutable. It appears so unchangeable, that we find it retained in an abscess for weeks, without having undergone any alteration. These qualities, however, only belong to perfect pus. If a healthy sore inflames, the matter, now produced from it, though unmixed with extravasated blood, or dead solids, becomes much sooner putrid, and much more irritating, than the discharge, formed before this alteration of the ulcer. (*Hunter.*)

In the preceding paragraph, it is stated, that matter remains very often unchanged in abscesses for weeks. This expression of Hunter's is not strictly correct; for, it is well known, that the surfaces of the cavities of abscesses are always absorbing, as well as secreting ones; consequently, there must be a continual mutation going on in the contained matter.

When there are diseased bones, or other extraneous bodies, exciting irritation, sometimes even in so great a degree as to make the vessels bleed, and often wounding the vessels of the part, the matter is always found to be very offensive. This state of the discharge is one mark of a diseased bone.

The discharge of an unhealthy sore blackens silver probes, and preparations of lead. This effect is imputed by Dr. Crawford to the sulphurated hydrogen gas, generated in the matter. (*Phil. Trans. vol.* 80. *Year* 1790, *p.* 385.) Further interesting observations on the nature of pus may be found in an Essay on the Differences between Pus and Mucus, by Dr. Darwin, junior; also in Dr. G. Pearson's Paper in Philos. Trans. 1811.

### USE OF PUS.

By some it is supposed to carry off humours from the constitution. Suppuration is sometimes regarded as a constitutional disease, changed into a local one, which constitutional malady is discharged, or thrown out of the body, either in the form of pus, or together with this fluid. Critical abscesses have been thought to be cases of this sort. Suppuration has also been imagined to carry off local complaints from other parts of the body, on the old principle of derivation, or revulsion. For this reason, sores or issues are made in sound parts before allowing other sores to be dried up. Suppuration is sometimes excited with a view of making parts, such as indurated swellings, dissolve into pus; but, we have endeavoured to shew, that no dissolution of the solids is concerned in the production of pus.

A secretion of pus is looked upon as a general prevention of many, or of all, the causes of disease. Hence, issues are made to keep off both universal as well as local diseases. However, the use of pus is perhaps unknown; for, it is formed most perfectly from healthy sores, and in healthy constitutions; and large discharges from parts not very essential to life, produce very little change in the constitution, and as little upon being healed up, whatever some may suppose to the contrary. (*Hunter.*)

This is certainly the case with many old ulcers, the suppuration from which seems to have little, or no effect, in impairing the health. Nor is there any real reason to be afraid of healing such ulcers, when possible, lest a worse disease should follow from the stoppage of a discharge, to which the system is supposed to be habituated so much, that the continuance of it must be essential to health.

Every one knows, that when there is no interference of art, that is, when the surface of a sore is left uncovered, the thin part of the matter evaporates, and the thick part dries and forms a scab. Nature, therefore, seems to have designed, that one use of pus should be to make a cover, or protection, for ulcerated surfaces. But I cannot agree with what has been asserted (*Hunter*), that the natural healing of a sore under a scab takes place more quickly, than when surgical dressings are employed.

Among the secondary uses of suppuration, may be mentioned, opening a communication between a disease and the external surface of the body; forming a passage for the exit of extraneous bodies, &c.

### TREATMENT WHEN SUPPURATION MUST TAKE PLACE.

In cases of inflammation, arising from accident, but so circumstanced, that we know suppuration cannot be prevented, the indication is to moderate the inflammation, which, if the powers are great, and the injury done considerable, will probably be very violent. If the constitution should also be much affected, certain general means are proper, such as bleeding, purging, and nauseating medicines. While the constitution continues to be disturbed, suppuration cannot take place in the most favourable manner. In these cases, also, such medicines as produce a gentle perspiration greatly relieve the patient, for instance, the pulv. ipecac. comp.; antimonials; aq. ammon. acet.; saline draughts, &c. Opiates may produce a temporary diminution of action; but, it is not always the consequence of this medicine, as there are constitutions, which it renders more irritable, and of course where it aggravates the inflammatory action.

The applications to inflammations, which are to suppurate and form an abscess, commonly used, are poultices and fomentations. These, however, appear to be applied without much critical exactness, or discrimination; for, they are applied before suppuration has taken place, and when this event is not desired; and they are also applied after suppuration has taken place. With respect to suppuration itself, abstracted from all other considerations, the indication cannot be the same in every state; but if poultices and fomentations are found to be of real service in the two stages of the disease, there must be something common to both, for which they are of service, independently of simple suppuration. Poultices are useful, when the inflammation attacks the skin, either in the first instance or after an abscess has approached so near the skin, that this becomes secondarily affected. This benefit appears to arise from the skin being kept soft and moist. Such is the use of a poultice in inflammation, either before or after suppuration, until the abscess is opened. But, when poultices and fomentations are applied to inflamed parts, in which we wish to avoid suppuration, reason and principle will not justify the practice, though such applications may be proclaimed by experience to be very proper. (*Hunter.*)

### TREATMENT AFTER SUPPURATION HAS TAKEN PLACE.

When suppuration cannot be stopped, or resolved, it is in general to be promoted.

How far suppuration can be increased by medicines, or applications, is doubtful; but attempts are generally made, and, for this purpose, suppurating cataplasms and plasters, composed of the warm gums, seeds, &c. have been recommended. Mr. Hunter doubted, whether such applications had any considerable effect in the way intended; for, if they were put on a sore, they would hardly increase the discharge from it, and, perhaps, even diminish it. However, in many cases, in which the parts are indolent, and hardly admit of true inflammation, in consequence of which a perfect suppuration cannot take place, stimulating the skin brings on a more salutary inflammation, and of course a quicker inflammation.

These applications have been found, however, to bring the matter more quickly to the skin, even in the most rapid suppurations. This effect has been mistaken for an increased formation of pus; but, this consequence can only follow in cases, in which the inner surface of the abscess is within the influence of the skin. The accelerated progress of the matter to the surface of the body arises from another cause, viz. the promotion of ulceration in the parts, between the collection of matter, and the cuticle.

Emollient poultices are commonly applied to inflamed parts, when suppuration is known to have taken place. These can have no effect upon suppuration, except that of lessening the inflammation, or rather making the skin more easy. The inflammation must have reached the skin before poultices can have much effect, for they can only affect that part. The ease of the patient, however, should be considered, and we find, that fomentations and poultices are often beneficial in this way. By keeping the cuticle moist and warm, the sensitive operations of the nerves of the parts are soothed. On the contrary, if the inflamed skin is allowed to dry, the inflammation is increased, and as suppuration is probably not checked by the above treatment, it ought to be put into practice. As warmth excites action, the fomentation should be as warm as the patient can bear, without inconvenience. (*Hunter.*)

"The local treatment in phlegmonous abscesses (as Professor Thomson observes) is still more simple, than that by which we endeavour to procure resolution. It consists almost solely in the application of a moderate degree of warmth and moisture to the inflamed part, either by means of fomentations, or poultices. The manner in which these means act in promoting suppuration is unknown. Independently of their temperature, it seems very doubtful, whether fomentations and poultices have any power of promoting suppuration in the parts, to which they are applied. They keep the cuticle moist and warm, they promote perspiration, they sooth and allay pain in many inflammations, and these are probably the only immediate effects, which they produce. The rest is the work of nature. In suppurations, attended by very severe pain, the use of warm fomentations is often found to afford singular relief, not only by their effect in easing pain, but also by their seeming to shorten the duration of the suppurative stage. In the cases of suppuration, in which they give relief, they should be repeated every four or six hours. The most common way of employing them, is by wringing linen, or woollen cloths, out of warm water, and applying these to the inflamed part, of as high a temperature as the feelings of the patient can bear. Decoctions of herbs were formerly much employed in the way of embrocation, and were then, and are still by many practitioners, supposed to possess peculiar virtues in promoting suppuration. Whether embrocations with the narcotic herbs might not in some cases be beneficial, by producing a sedative effect in allaying pain, I am unable to say, though I am inclined to believe, that even they act chiefly by their warmth and moisture. In cases where you find it necessary to use an embrocation with herbs, the flowers of camomile may in general be substituted in place of the leaves or flowers of almost every other plant. These flowers readily imbibe and retain moisture. They are, when moist, of a soft consistence, and can be easily moulded to the figure of the parts, to which they are applied." (*Thomson's Lectures, p.* 333.) Oatmeal, crumb of bread, and especially linseed meal, are the ingredients mostly prefered in this country for emollient poultices. When bread is used, it is generally boiled in milk. The observations, however, which we have offered on poultices in another place, are all now equally applicable. (See *Inflammation.*)

### OF THE TIME WHEN ABSCESSES SHOULD BE OPENED.

As abscesses, wherever formed, must increase that part of their cavity, which is next to the skin, more quickly than the bottom, they must become, in some degree, tapering towards the latter part, with their greatest breadth immediately under the skin. This shape of an abscess, when allowed to take place, is favourable to its healing, for it puts the bottom, which is the seat of the disease, more upon a footing with the mouth of the abscess, than it otherwise could be. As the bottom, or part, where the abscess began, is more or less in a diseased state; and as the parts between the seat of the abscess and the external surface are sound parts, having only allowed a passage for the pus, they, of course, have a stronger disposition to heal, than the bottom has.

To keep the mouth of an abscess from healing before its bottom, the collection of matter should be allowed to break of itself; for, although abscesses in general only open by a small orifice, more especially when sound, yet, in such cases, the skin over the general cavity of the matter is so thinned, that it has very little tendency to heal, and often ulcerates and makes a free opening. If the latter event should not spontaneously occur, it may now be more easily obtained by the interference of the surgeon.

Abscesses, which are the most disposed to heal favourably, are the quickest in their progress to the skin, and the matter comes to the surface almost at a point; the swelling is not so conical as in other cases, and when it bursts, the orifice is exceedingly small. On the other hand, when there is an indolence in the progress of the abscess, the collection spreads more, or distends the surrounding parts in a greater degree, in consequence of their not being so firmly united by inflammation, in the one as they are in the other instance; nor will ulceration so readily take the lead, and the matter will come to the skin by a broad surface, so as to thin a large portion of the cutis. (*Hunter.*)

It may certainly be set down as a general axiom, that all phlegmonous abscesses should be allowed to break, and not be opened by the surgeon. When punctured unnecessarily, or prematurely, they never heal so favourably as when left to themselves.

Particular cases, however, should be opened, as soon as the existence of matter is ascertained. Abscesses should only be allowed to burst of themselves, when the confinement of the matter can do no mischief. Abscesses in the abdomen, or thorax, under the cranium, in the eye, and joints, should be mostly opened very soon. When suppuration takes place beneath ligamentous expansions, or aponeuroses, which invariably retard the progress of the matter to the surface of the body, an early opening should be made. If this be not done, the matter spreads to a great extent, separating such ligamentous expansions from the muscles, and the muscles from each other, and, as the pus cannot get to the surface of the body, the length of the disorder is of course increased. When matter is so situated, as to be liable to insinuate itself into the chest, or abdomen, or into the capsular ligaments of the joints, it is highly proper to prevent this extension of mischief, by making a timely opening into the abscess.

"Those abscesses ought to be opened early (says Professor Thomson), that are situated in parts, through which the matter is liable to become widely diffused. This is particularly the case with abscesses, that are situated on the forepart of the neck, or in the cavity of the axilla, or by the side of the rectum. When matter is formed in the cavity of the axilla, if it does not speedily obtain an external outlet, it is very liable to pass up towards the clavicle in the course of the axillary plexus of nerves and vessels, or forwards under the pectoral muscle. I have repeatedly seen axillary abscess take both of these directions at the same time, forming one of the most painful and difficult cases to treat, which occurs in the management of abscesses." Dr. Thomson also considers an early opening proper and necessary, where the matter is lodged, as in some cases of whitloe, in the sheaths of the tendons; where matter is formed under the periosteum; where it collects under fasciæ, or in the vicinity of large arteries, joints, or the greater cavities of the body: also when the abscess is deep-seated. (See *Thomson's Lectures on Inflammation, p.* 336—338.)

With respect to making an early opening into abscesses, situated near large arteries, I am not aware, that any danger of the artery ulcerating in consequence of the nearness of the pus really exists. Therefore, some doubts may reasonably be entertained of Professor Thomson's advice in this particular case, as the general rule of opening abscesses near large blood-vessels, in an early stage of the disease, would be objectionable on the ground of the practice exposing the vessels themselves to injury. Indeed, this well-informed writer distinctly mentions, in considering the subject in question, that the arteries are not very susceptible of ulcerating absorption.—(*P.* 337.)

### OF THE PLACE WHERE THE OPENING SHOULD BE MADE.

If a free opening is not required, or making one is not practicable, it is at least proper to make whatever opening can be made in a depending situation. By this means the matter will more readily escape, and all pressure arising from the confinement or lodgment of pus, will be prevented. A very small degree of pressure on that side of the abscess which is next to the skin, may produce ulceration there; and although such pressure might not, in many cases, be so great as to produce ulceration at the bottom of the abscess; yet it may be sufficiently great to prevent granulations from forming on that side, and thereby retard the cure, as no union can take place, but by means of granulations. The pressure is always most, and retards the formation of granulations in the greatest degree, at the most depending part of the abscess. Hence, if no opening be made in this situation, the upper part of the abscess readily heals to a small point, which becomes a fistula.

When circumstances forbid making an opening at the most depending part of an abscess, perhaps, nothing more can be done, than to evacuate the matter as often as necessary, and gently to compress the sides of the abscess together, when the situation of the case admits of the practice.

But abscesses are not always to be opened at the most depending part. The distance between the matter and the skin at this part is the common reason against the method. If an abscess is rather deeply situated, and points in a place which is higher than where the collection lies, it is proper to make the opening where the conical eminence, or, as it is termed, the *pointing*, appears. Thus, if an abscess should form in the centre of the breast, and point at the uppermost part, which is often the case, it would be improper to cut through the lower half of the mamma, in order to make a passage for the matter in that direction. If an abscess should form on the upper part of the foot, it would be wrong to make an opening through the sole of the foot to get at the most depending part of the abscess; for, besides cutting such a depth of sound parts, a great many useful ones would be destroyed.

When the abscess does not point in a depending situation, as in the instances just cited, since the place where the matter threatens to open a passage is likely to be the future opening, and this situation is disadvantageous to the healing of the deep part of the abscess, it is generally best to let the collection of matter first burst of itself, and then dilate the opening as freely as necessary. By allowing abscesses to burst spontaneously, the opening is not so apt to heal as if made by art, and, therefore, is better in such situations. (*Hunter.*)

In most cases, it is more advantageous even to cut through a certain thickness of parts, for the sake of obtaining a depending opening, than to make an opening, where the pointing appears, that is, where the parts are thinnest, and the matter nearest the surface. This remark is highly worthy of remembrance, when there is no doubt of the existence of matter at the depending place, and when the parts to be divided are not important ones. Collections of matter beneath the fasciæ of the fore-arm and thigh particularly demand attention to this direction, as they commonly point where those ligamentous expansions are thinnest, not where the matter can most readily escape.

Abscesses in the sheath of the rectus abdominis should also be opened in a low situation.

### DIFFERENT METHODS OF OPENING ABSCESSES.

All abscesses will naturally burst of themselves, unless the matter be absorbed, and, in general, they ought to be allowed to take this course. There are, however, as we have already explained, particular circumstances which require an early opening; but, when the skin over the abscess is very thin, it is not of so much consequence, whether the case be permitted to burst of itself, or it be opened by the surgeon.

When abscesses are large, it is generally necessary to open them by art, whether they have burst of themselves or not; for, the natural opening will seldom be sufficient for the completion of a cure; and, although it may be sufficient for the free discharge of the matter, yet these abscesses will heal much more readily when a free opening is made; for, the thin skin over the cavity granulates but indifferently, and therefore unites but slowly with the parts underneath. (*Hunter.*)

Abscesses may be opened either by an incision, or by making an eschar with caustic. To the latter plan, however, many urge strong objections: the use of caustic is not usually attended with any advantage which may not be obtained by a simple incision; upon a tender inflamed part it gives much more pain; it is more slow in its effects; and the surgeon can never direct the operation of the caustic so accurately as to destroy exactly the parts which he wishes, and no more. If the eschar be not made deeply enough, the lancet must, after all, be used. Caustic also leaves, after its application, a disagreeable scar, a consideration of some importance in opening abscesses about the female neck or face. To these numerous objections we have to add, that the eschar is, very frequently, ten or twelve tedious days in becoming detached.

When there is a redundance of skin, or when there is a good deal of it thinned, however, an opening made with caustic will answer, perhaps, as well as an incision. The application of a caustic may also sometimes be advantageously resorted to when there is a good deal of indolent hardness around a small abscess.

The *calx cum potassa*, or the *potassa* alone, is the best caustic for opening abscesses. The part is first to be covered with a piece of adhesive plaster, which has a portion cut out exactly of the same figure and size as the opening intended to be made in the abscess. The best way of making the eschar, is to dip the end of the caustic in water, and to rub it on the part till the skin becomes brown. The active substance is then to be immediately washed off with some wet tow, the plaster is to be removed, and an emollient poultice applied.

In almost all cases, it is better to use the lancet, or double-edged bistoury. Either of these instruments opens the abscess at once, and with less pain, than results from the use of caustic; it occasions no loss of substance, consequently a smaller cicatrix; and, by using it, the opening may be made in the most advantageous direction, and of the exact size required.

### DRESSINGS AFTER OPENING ABSCESSES.

When an abscess has burst of itself, and it is unnecessary to enlarge the opening, all that is requisite is to keep the surrounding parts clean. The continuation of the same kind of poultice, which was before used, is, perhaps, as good a practice as any; and when the tenderness, arising from the inflammation, is over, lint and a pledget may be made use of, instead of the poultice.

But, an abscess, opened by a cutting instrument, is both a wound and a sore, and partakes more of the nature of a fresh wound in proportion to the thickness of the parts cut. Hence, it is necessary that something should be put into the opening to keep it from healing by the first intention. If it is lint, it should be dipped in some salve, which will answer better than lint alone, as it will allow of being taken out sooner. This is advantageous, because such sores should be dressed the next day, or, at latest, on the second day, in order that the pus may be discharged again. When the cut edges of the opening have suppurated, which will be in a few days, the future dressings may be as simple as possible, for nature will, in general, complete the cure.

If the abscess has been opened by caustic, and the slough has either been cut out or separated of itself, the case is to be regarded altogether as a suppurating sore, and dressed accordingly.

Perhaps, dry lint is as good a dressing as any, till the nature of the sore is known. If it should be of a good kind, the same dressing may be continued; but, if not, then it must be dressed accordingly. Parts, which at first appear to be sound, sometimes assume every species of disease, whether from indolence, from irritability, from scrophulous, and other dispositions. This tendency to disease arises, in some cases, from the nature of the parts affected, as, for instance, bone, ligament, &c. (*Hunter.*)

*Consult particularly Mr. John Hunter's Treatise on the Blood, Inflammation, and Gunshot Wounds, a work, in which more interesting knowledge respecting Abscesses and Suppuration is contained, than in any other one ever published.* See also *Traité de la Suppuration de F. Quesnay*, 1749. *Various parts of the Mémoires de l'Academie de Chirurgie. L'Encyclopédie Méthodique, Partie Chirurgicale, article Abcès. Dissertations on Inflammation by John Burns*, 1800. *E. Home's Dissertation on the properties of Pus*, 1788; *and his Pract. Obs. on Ulcers, 2d Edit.* 1801. *C. Darwin's Experiments, establishing a criterion between mucilaginous and purulent matter, &c. Lichfield*, 1780. *Several parts of Pott's Chirurgical Works, but especially his Treatise on the Fistula in ano. Richter's Anfangsgründe der Wundarzneykunst, Band* 1, *Kap.* 2. *Callisen's Systema Chirurgiæ Hodiernæ in many places. Dr. J. Thomson's Lectures on Inflammation, p.* 305, *&c. Edinb.* 1813; *a work, in which a profound knowledge of medical science, and of surgery in particular, is every where conspicuous. Pearson's Principles of Surgery; p.* 34, *&c. Edit.* 2. *Lassus Pathologie Chirurgicale, Tom.* 1, *p.* 21, *&c. &c. Edit. of* 1809. *Dr. G. Pearson's Obs. and Experiments on Pus in the Philosophical Trans. for* 1811.

**SURGERY, or CHIRURGERY,** (derived from chirurgeon, from ϰειϱ the hand, and εϱγον, work), has been by many considered to be that branch of medicine, which principally effects the cure of diseases by the application of the hand alone, the employment of instruments, or the use of topical remedies. (*Encyclopédie Méthodique, Partie Chir. Tom.* 1, *Art. Chirurgie.*) But, although this definition certainly conveys to us some idea of the nature of this most useful profession, it is not entirely accurate as applied to the present state of practice. It might indeed be correct during that short unfavoured period of surgery upon the continent, some centuries ago, when its practice was denounced by the Council of Tours, as unfit for the hands of priests and men of literature, and when the surgeon became little better than a sort of professional servant to the physician, the latter alone not only having the sole privilege of prescribing internal medicines, but even that of judging and directing when surgical operations should be performed. Then the subordinate surgeon was only called upon to execute with his knife, or his hand, duties, which the more exalted physician did not choose to undertake; and, in fact, he visited the patient, did what was required to be done, and took his leave of the case, altogether under the orders of his master. In modern times, however, the good sense of mankind has discovered, that surgery is deserving of an eminent rank amongst such arts as ought to be cultivated for the general benefit of society; that the man, who is not himself accustomed to the performance of operations, cannot be the best judge of their safety and necessity; and, that, in every point of view, the surgical practitioner merits as much favour and independence in the exercise of his profession, as he whose avocation is confined to physic. Hence, the surgeon is now exclusively consulted about many of the most important diseases, to which the human body is liable. Being no longer under the yoke of the physician, he follows the dictates of his own judgment and knowledge; he prescribes whatever medicines the case may demand, internal as well as external; and under the encouragement of an enlightened age, he sees his profession daily becoming more scientific, more respected, and more extensively useful.

By some writers, physic is said to have for its object the treatment of internal, surgery that of external diseases. This definition, however good and plausible it may at first appear, can only be received with numerous exceptions in regard to modern surgery: for instance, the psoas abscess; stone in the bladder; an extravasation of blood within the skull in consequence of accidental violence; are universally allowed to be strictly chirurgical cases; yet, no man in his senses would call these disorders external.

Others have defined surgery to be the mechanical part of physic, "*quod in therapeia mechanicum*;" but, although this has obtained the assent of so eminent a modern surgeon, as Professor Richerand, of Paris, (*Dict. des Sciences Medicales*, *Tom.* 5, *p.* 85.) I believe few on this side of the water will be of his opinion. As Mr. John Pearson has observed: "Many people have imagined, that when a man has learnt the art of dressing sores, of applying bandages, and performing operations with a little dexterity, he must necessarily be an accomplished surgeon. If a conclusion so gross and fallacious had been confined to the vulgar and illiterate, the progress of scientific surgery would have suffered little interruption; but if young minds are directed to these objects, as the only important matters upon which their faculties are to be exercised; if the gross informations of sense constitute the sum of their knowledge, little more can be expected from such a mode of study, than servile imitation, or daring empiricism. Indeed, some people have affected to oppose surgery as an *art* to medicine as a *science*; and if their pretensions were justly founded, the former would certainly be degraded to a mere mechanical occupation. But, it is not very easy to comprehend the grounds of such a distinction. The internal and external parts of the body are governed by the same general laws during a state of health; and, if an internal part be attacked with inflammation, the appearances and effects will bear a great similarity to the same disease situated externally; nor are the indications of cure, in general, materially different. If by science, therefore, be meant "a knowledge of the laws of nature," he who knows, what is known of the order and method of nature, in the production, progress, and termination of surgical diseases, merits as justly the title of a scientifical practitioner, as the well-educated physician. The practical parts of physic and surgery are very frequently disunited; but, their theory and principles are indivisible, since they truly constitute one and the same science." (*Pearson's Principles of Surgery*, *Preface.*)

But, though we can object on good grounds to the above-mentioned definitions of surgery, it seems impossible to offer any other, against which equal objections could not be brought. In fact, how is it possible to define surgery with any degree of accuracy, until the boundaries between it and physic can be determined? Richerand talks indeed of the Medical School of Paris having now successfully established the limits and objects of surgery, and he boasts of this as an original improvement reflecting credit on his countrymen. (See *Dict. des Sciences Med. T.* 5, *p.* 88.) Yet, what are we to think, when we remember, not only that he has, in the commencement of the very same article, defined surgery to be "*quod in therapeia mechanicum*," but that by way of illustrating what the Parisian School has accomplished, he says, that surgery was first demonstrated by it to be only a means of physic, and not a separate and distinct science? (See also *Dict. des Sciences Med.* article *Chirurgicales, Maladies.*)

As a learned Professor notices, the limits between physic and surgery are not very precisely marked, and the respective functions of the physician and surgeon, long as those names have existed, are still but very inaccurately defined. "The most superficial acquaintance with the symptoms, progress, and termination, of the various morbid affections to which the human body is liable, must be sufficient to convince every unprejudiced enquirer, that there is but a slight foundation, if indeed there be any, for this distinction, in the nature of the diseases, which these practitioners are required to treat, or in the modes of treatment, by which the diseases themselves may be cured, or relieved. Experience has long shewn, that the use of internal remedies is not only required in a large proportion of the diseases, which are regarded as strictly chirurgical, but, also, that there are few diseases, which come under the care of the physician, in which, morbid affections, requiring the manual aid, or practical skill of the surgeon, do not frequently occur.

"The treatment of febrile and internal inflammatory diseases, it will be allowed, belongs exclusively to the province of the physician, wherever the distinction between physician and surgeon has been introduced, and is rigidly observed; yet, in some species of fevers, and in all internal inflammatory diseases, blood-letting is often the principal, if not the only remedy that is required. But, this is an operation, however urgent the necessity for it be, which from engagement the physician cannot, and from the fear of degrading his province of the profession, will not perform. Retention of urine not unfrequently takes place in symptomatic febrile diseases, and this is an affection, which does not always yield to the use of internal remedies; but, it is an affection also, from the painful uneasiness, which it immediately excites, as well as from the danger, which it threatens, that will not admit of delay. When internal remedies, therefore, fail in relieving the patient, the urine must be speedily drawn off by means of a chirurgical operation; otherwise inflammation, mortification, and rupture of the bladder, must necessarily ensue. Febrile and internal inflammatory affections terminate not unfrequently in the formation of fluids, which it is necessary to let out by a chirurgical operation; and abscesses, fistulous openings, and ulcers are formed, which require the aid of the surgeon. In patients, also, affected with severe febrile diseases, from being long fixed down to their beds in one position, some of the parts of the body, upon which they rest, occasionally acquire a disposition to mortify, larger or smaller portions of the skin and subjacent cellular membrane becoming dead, separate from the living parts, and sores are formed, which are but too often the subject of unavailing chirurgical practice. To employ, in the different stages of this species of mortification, from its first commencement to the complete separation of the dead parts, and the formation of a new skin, the appropriate external and internal remedies, requires a greater share of chirurgical skill, than can reasonably be expected in those who make a profession solely of physic. Unhappy, therefore, must be the lot of that patient, who, in circumstances similar to those which I have described, has the misfortune to have for his sole medical attendant, a physician ignorant of surgery.

"But (continues Professor Thomson), if a knowledge of surgery be necessary to the student, who intends to practise physic, the knowledge of physic, on the other hand, is no less necessary to him, who intends to devote his attention exclusively to the profession of surgery; for, indeed, there are few chirurgical diseases, which are not in some period, or another, of their existence, accompanied by morbid affections of the same nature with those, which fall properly and most frequently under the care of the physician. It will only be necessary to mention, as examples of these affections, the symptomatic fever, which attends inflammation, whether this affection has been induced by external injury, or has occurred spontaneously in the body from internal disease; the hectic fever, supervening to long continued processes of suppuration; the febrile state, and other morbid affections, which are sometimes brought on by the too sudden and injudicious use of mercury; bilious fevers, and the various derangements of the digestive organs, which are sometimes the cause, and at other times the consequence, of local diseases; the nervous affections, such as apoplexy, convulsions, paralysis, and mania, which arise not unfrequently from injuries of the head; and locked jaw, or tetanus, which, in warm climates particularly, is so very liable to be induced by punctured wounds. These are morbid affections, the proper study and treatment of which, when they occur, without local injury, are supposed to belong to the physician, rather than the surgeon; but, occurring very frequently as they do in chirurgical diseases, and always modifying, or aggravating the effects of these diseases, ignorance of their nature, relations, and modes of cure, is not only inexcusable, but highly criminal in the practitioner, who ventures to undertake their treatment." (*Thomson's Lectures on Inflammation, Introduction.*)

From what has been stated, I think it very certain, that there never can be a complete scientific division of the healing art into physic and surgery; and that all attempts to distinguish the numerous diseases and injuries of the human body into medical and surgical cases, must in a great measure be decided by custom, and the mutual agreement of practitioners, rather than by any rules, or principles, which are at all consistent.

In the earliest periods, the same men cultivated the whole field of medicine. The writings of Hippocrates, Galen, Celsus, Paulus Œgineta, Albucasis, &c.

prove, that the Greeks, Romans, and Arabians never had an idea of the human body being susceptible of only two classes of diseases, one of which formed the province of physic, while the other constituted a separate and distinct science called surgery. All these ancient authors treat successively of fevers, fractures, wounds, and nervous diseases, and none of them appear to have supposed, that there could be any disorders, which really deserved to be called *external* and others *internal*. About the middle of the twelfth century, however, the Council of Tours prohibited the ecclesiastics from undertaking any bloody operation. Surgery was then rejected from the universities, under the empty pretext, "*Ecclesia abhorret a sanguine*," often expressed, in its decrees, as Professor Thomson well observes, but never acted upon, except in this instance, by the church of Rome. It is to this epoch that we must refer the true separation of physic from surgery, the latter being abandoned to the laity, who, in those ages of barbarism, were totally illiterate.

It is an observation made by the celebrated Bichat, that two things are essentially necessary to form a great surgeon, viz. genius and experience. One traces for him the way; the other rectifies it; both reciprocally assist in forming him. Without experience, genius would be unprofitably fertile; without genius, experience would only be a barren advantage to him. (*Œuvres Chir. de Desault par Bichat, Tom.* 1. *Discours Prelim.*) Out of the large number of hospital surgeons, who are to be met with in every country of Europe, and who enjoy ample opportunities of profiting by the lessons of experience, how few distinguish themselves, or ever contribute a mite to the improvement of their profession. Opportunity, without talents and an aptness to take advantage of it, is not of more use, than light to a blind man. On the other hand, splendid abilities, without experience, can never be enough to make a consummate surgeon, any more than a man with the greatest genius for painting can excel in his particular art, without having examined and studied the real objects, which he wishes to delineate. In short, as a sensible writer has remarked, "*Les grands chirurgiens sont aussi rares, que le génie, le savoir, et les talens.*" (*Mém. de l'Acad. de Chir. Tom.* 1. *Pref. p.* 41. *Edit.* 12*mo.*)

The description of the qualities, which a surgeon ought to possess, as given by Celsus, is excellent as far as it goes. A surgeon (says he) should be young, or, at any rate not very old; his hand should be firm and steady, and never shake; he should be able to use his left hand with as much dexterity as his right; his sight should be acute and clear; his mind intrepid and pitiless, so that when he is engaged in doing any thing to a patient, he may not hurry, nor cut less than he ought, but finish the operation, just as if the cries of the patient made no impression upon him. (*A. C. Celsi Med. Præf. ad lib.* 7.)

"By the word "*immisericors*," as Richerand has observed, (*Nosogr. Chir. Tom.* 1. *p.* 42, *Edit.* 2.) Celsus did not mean, that a surgeon ought to be quite insensible to pity; but, that during the performance of an operation, this passion should not influence him, as all emotion would then be mere weakness. This undisturbed coolness, which is still more rare than skill, is the most valuable quality in the practice of surgery. Dexterity may be acquired by exercise; but, firmness of mind is a gift of nature. Haller, to whom nature was so bountiful in other respects, was denied this quality, as he candidly confesses. "Although (says he) I have taught surgery seventeen years, and exhibited the most difficult operations upon the dead body, I have never ventured to apply a cutting instrument to a living subject, through a fear of giving too much pain." (*Bibl. Chir.* 1775, *Tom.* 2.)

Surgery may boast of having had an origin, that well deserves to be called noble; for, the earliest practice of it arose from the most generous sentiment which nature has implanted in the heart of man, viz. from that sympathetic benevolence, which leads us to pity the misfortunes which we behold, and inspires us with an anxious desire to alleviate them. He who first saw his fellow creature suffer could not fail to participate in the pain, and endeavour to find out the means of affording relief. Opportunities of exercising this useful inclination were never wanting. In the first ages of the world, man in his destitute state was under the necessity of earning, by force, or stratagem, a subsistence which was always uncertain, and in the combats into which this sort of life drew him, he frequently met with wounds, and other injuries. The consequence was, that he began at a very early period to pay attention to the mode of curing such accidental hurts. Wars, by multiplying wounds, at the same time increased the necessity for assistance, and enhanced its value. Kings themselves then did not disdain to dress wounds, and several of the warriors sung by Homer, derived not less renown from their skill in surgery, than their valour in war. Such were Chiron, Machaon, and Podalirius.

In fact, amongst the ancients, the profession of medicine and surgery constituted a sacred kind of occupation, and the practice of it belonged only to privileged persons. Esculapius was the son of Apollo.

In the armies, the highest princes gloried in dressing the wounds of those, who had fought the battles of their country. Amongst the Grecians, Podalirius, Chiron, and Machaon, were not only distinguished for their valour, but also for their skill in surgery, as we learn from the poem of the immortal Homer. The value which was placed upon the services of Machaon by the Grecian army may well be conceived from the anxiety which they evinced to have him properly taken care of, when he was wounded in the shoulder with a dart. "O Nestor, pride of Greece, (cries Idomeneus) mount, mount upon thy chariot! and let Machaon mount with thee! Hasten with him to our ships; for, a warrior who, like he, knows how to relieve pain, and cure wounds, is himself worth a thousand other heroes." (See *Iliad, lib.* xi.) Hippocrates was one of the first citizens of Greece; he nobly refused all the rich offers of several kings, enemies of his country, to entice him into their service; and, in particular, he disdained to accept those of Xerxes, whom he regarded as a barbarian.

It is in the immortal poems of the Iliad and Odyssey, that we find the only certain traditions respecting the state of the art before the establishment of the republics of Greece, and even until the time of the Peloponnesian war. There it appears, that surgery was almost entirely confined to the treatment of wounds, and that the imaginary power of enchantment was joined with the use of topical applications.

In the cures, recorded in the sacred writings of the Christian religion, the intervention of a supernatural power is always combined with what is within the scope of human possibility. The same character evinces itself in the infancy of the art in every nation. The priests of India, the physicians of China and Japan, and the jugglers of the savage or half civilized tribes of the old and new continents, constantly associate with drugs and manual operations certain mysterious practices, upon which they especially rely for the cure of their patients. Such was also, no doubt, the character of the medicine of the Egyptians in the remote times, previous to the invention of the alphabet, and upon which so very little light is now thrown.

It is curious, however, to find from some late observations made by the men of science, who accompaniedt he French expedition to Egypt in 1798, that amongst the ruins of ancient Thebes there are documents, which fully prove, that surgery in the early times of the Egyptians, had made a degree of progress, of which few of the moderns have any conception. It is noticed by Larrey, that, when the celebrated French General Desaix had driven the mamalukes beyond the cataracts of the Nile, the Commission of Arts had an opportunity of visiting the monuments of the famous Thebes, and the renowned temples of Tentyra, Karnack, Medynet Abou, and Luxor, the remains of which still display their ancient magnificence. It is upon the ceilings and walls of these temples, that basso-relievos are seen representing limbs that had been cut off with instruments very analogous to those which are employed at the present day for amputations. The same instruments are again observed in the hieroglyphics, and vestiges of other surgical operations may be traced, proving, that in these remote periods, surgery kept pace with the other arts, which had already attained a high degree of perfection. (See *Larrey's Mémoires de Chirurgie Militaire, Tom.* 1, *p.* 233; *and Tom.* 2, *p.* 223.)

We next come to the epoch, when by the union and arrangement of scattered facts, the science truly arose. Hippocrates, born in the island of Cos, four hundred and sixty years before the common æra, collected the observations of his predecessors, added the results of his own experience, and composed his first treatises. In the hands of this great genius, medicine and surgery did not make equal progress. The former reached the highest degree of glory. Hippocrates drew up the history of acute diseases in so masterly a style, that twenty past centuries have hardly found occasion to add any thing to the performance. But, surgery was far from attaining the same degree of perfection. The religious veneration for the asylums of the dead, and the impossibility of dissecting the human body, formed an insurmountable obstacle to the study of anatomy. An imperfect acquaintance with the structure of animals reputed to bear the greatest resemblance to man, could only furnish venturesome conjectures, or false inferences. These circumscribed notions sufficed for the study of acute diseases. In these cases, the attentive observation of strongly marked symptoms, and the idea of the operation of a salutary principle, derived from remarking the regular succession of such symptoms, and their frequently beneficial termination, enlightened the physician in the employment of curative means; while surgery, deprived of the assistance of anatomy, was too long kept back in an infant state. Whatever praises may have been bestowed on those parts of the works of Hippocrates particularly relating to surgery, and which amount to six in number (*de officina medici; de fracturis; de capitis vulneribus; de articulis vel luxatis; de ulceribus; de fistulis;*) when compared with his other acknowledged legitimate writings, they appear only as the rough sketches of a picture by a great master.

Excepting the fragments, collected or cited by Galen, we possess no work written by any of the successors of Hippocrates until the period of Celsus; which leaves a barren interval of almost four centuries. In this space lived Erasistratus, as well as Herophilus, celebrated for the sects which they established, and, particularly, for having been the first who studied anatomy upon the human body.

Celsus lived at Rome in the reigns of Augustus, Tiberius, and Caligula. He appears never to have practised the healing art, on which however he has written with much precision, elegance, and perspicuity. His work is the more precious, inasmuch as it is the only one, which gives us information with regard to the progress of surgery in the long interval between Hippocrates and himself. The four last books, and especially the seventh and eighth, are exclusively allotted to surgical matter. The style of Celsus is so elegant, that he has generally been regarded quite as the Cicero of medical writers, and long enjoyed high reputation in the schools. His surgery was entirely that of the Greeks, notwithstanding he wrote at Rome; for, in that capital of the world, physic was then professed only by persons who had either come from Greece, or had received instruction in the celebrated schools of this native soil of all the arts and sciences.

Let us pass over the interval which separates Celsus and Galen. This latter was born at Pergamus in Asia minor, and came to Rome in the reign of the emperor Marcus Aurelius. He practised surgery and physic there about the year 165 of the christian era, (*Galeni.Opera Omnia*, 1521. *Edit.Aldi, 5 vols. in fol.*) These two sciences were at that time still united, and though some writers of much earlier date speak of the division of physic into dietetical, chirurgical, and pharmaceutical, no such distinction was followed in practice. As Galen had been a surgeon at Pergamus, he continued the same profession at Rome; but being soon attracted by the predominating taste of the age, in which he lived, for a science, which more easily yields to the systems and dazzling speculations of philosophical sects, he afterwards neglected surgery which strictly rejects them. His writings prove, however, that he did not abandon it entirely. His commentaries on the treatise of Hippocrates, *De Officina Medici*, and his essay on bandages and the manner of applying them, shew that he was well versed even in the minor details of the art. Besides it is known, that he paid great attention to pharmacy, and, in his work upon antidotes, chapter 13, he tells us himself, that he had a drug shop in the via sacra, which fell a sacrifice to the flames, that destroyed, in the reign of Commodus, the temple of peace, and several other edifices.

To Galen succeeded the compiler Oribasius, Œtius of Amida, a physician, who lived towards the close of the fifth century, Alexander of Tralles, and Paulus Œgineta, so called from the place of his birth. This last collected into one work, still justly esteemed, all the improvements, which had been made in surgery up to his own time. Paulus concludes the series of Greek and Roman physicians, and he may be looked upon as the last of the ancients, unless it be wished to let the Arabians have a share in the honours of antiquity. Paulus practised at Rome and Alexandria. Afterwards the downfall of surgery followed that of all the other sciences, and from the capture of Alexandria by the Saracens under Amrou, viceroy of Egypt, in 641, until the end of the tenth century, nothing prevailed but the dark clouds of ignorance and barbarism.

Masters of a great part of the Roman empire, the Arabians dug up the Greek manuscripts, which lay buried under the ruins of the libraries; translated them; appropriated to themselves the doctrines which they contained; impoverished them with additions; and transmitted to posterity only enormous compilations. In a word, such are the treatises of Rhazes, Hali-Abbas, Avicenna, Averrhoes, and Albucasis, the most celebrated of the Arabian authors. Inventors of a prodigious number of instruments and machines, they appear to have calculated the efficacy of surgery by the richness of its arsenals, and to have been more anxious to inspire terror than confidence. As an instance of the cruelty of their methods, we shall merely notice, that, in order to stop the bleeding after amputation of a limb, they were in the habit of plunging the end of the stump into boiling pitch.

The fate of medicine was not more fortunate. In vain, the school of Salernum, founded about the middle of the seventh century, made some attempts to revive its splendour. Medical science being seated on the same benches, where the doctrine of Aristotle, accommodated to religious opinions, was the subject of endless controversies, imbibed, as it were by contagion, the argumentative and sophistical mania, and became enveloped in the dark hypotheses of scholastic absurdity. (*Richerand, Nosographie Chirurgicale, Tom.* 1.)

The universal ignorance, (continues this author); the pretended horror of blood; the dogma of a religion, which shed it in torrents for useless quarrels; an exclusive relish for the subtleties of the school, and speculative theories; are circumstances, further explaining the profound darkness, which followed these empty labours. About the middle of the twelfth century

(1163), the Council of Tours prohibited the ecclesiastics, who then shared with the Jews the practice of medicine in christian Europe, undertaking any bloody operation. It is to this epoch, that the true separation of medicine from surgery must be referred. The latter was abandoned to the laity, who in those ages of barbarism were almost all entirely unlettered and destitute of education. The priests, however, still retained that portion of the art, which abstained from the effusion of blood. Roger, Rolandus, Bruno, Gulielmus, de Salicetus, Lanfranc, Gordon, and Guy de Chauliac, confined themselves to commentaries on the Arabians, and mutilated surgery by reducing it almost entirely to the use of ointments and plasters. Guy de Chauliac, however, the last of the Arabians, must be excepted from this censure. His work, written at Avignon in 1363, in the pontificate of Urban the fifth, whose physician he was, continued to be for a long while, the only classical book in our schools. It may be observed, that as he imitated in every respect the other Arabian physicians, and like them thought that it did not become an ecclesiastic to deviate from the austerity of his profession, he has passed over in silence the diseases of women.

Antonius Benevenius, a physician of Florence, was the first who perceived, that the compilations of the ancients and Arabians ought to be relinquished for the observation of nature. (*De abditis rerum causis, Florent.* 1507, *in 4to.*) A new era now began. The moderns saw, that, by treading servilely in the footsteps of their predecessors, they could never succeed in equalling them. The labours of Vesalius gave birth to anatomy. Illuminated by this science, surgery, the restoration of which had been already prepared by the works of some Italian physicians, put on a different appearance in the hands of Ambroise Paré, the first and most eminent of the French surgeons.

Obeying the dictates of his genius, Paré made authority yield to observation, or sought to reconcile them, when envy, busily intent on persecuting him, represented his discoveries as a crime. Although he was the restorer, if not the inventor, of the art of tying the blood-vessels, he was compelled to make imperfect extracts from Galen, and alter the text, in order to rob himself, in favour of the ancients, of the glory, which this distinguished improvement deserved.

Surgeon of King Henry the second, Francis the second, Charles the ninth, and Henry the third, of France, he practised his profession in various places, followed the French armies into Italy, and acquired such esteem, that his mere presence in a besieged town, was enough to reanimate those employed for its defence. In the execrable night of Saint Bartholomew, his reputation saved his life. As he was of the reformed religion, he would not have escaped the massacre, had not Charles the ninth himself undertaken to protect him. The historians of those days (*Mém. de Sully*) have preserved the remembrance of this exception, so honourable to him who was the object of it; but, which should not diminish the just horror, which the memory of the most weak and cruel tyrant must ever inspire. "Il n'en voulut jamais sauver aucun (says Brantome) sinon maistre Ambroise Paré, son premier chirurgien, et le premier de la chrétienneté; et l'envoya quérir et venir le soir dans sa chambre et garderobe, lui commandant de n'en bouger; et disait qu'il n'était raisonnable qu'un qui pouvait servir à tout un petit monde, feust ainsi massacré."

Ambroise Paré was not content, like his predecessors, with exercising his art with reputation; he did not follow the example of the Quatre-Maîtres; of Pitard, so justly celebrated for having composed the first statutes of the College of Surgeons at Paris, in the reign of St. Lewis, whom he had attended in his excursions to the Holy Land; and of several other surgeons, the fruits of whose experience were lost to their successors. Paré transmitted the result of his own experience in a work that will remain immortal. (See *Œuvres d'Ambroise Paré, Conseiller et premier Chirurgien du Roi, divisées in* 28 *livres, in folio. Edit.* 4*to. Paris*, 1535.)

His writings, so remarkable for the variety and number of facts in them, are eminently distinguished from all those of his time, inasmuch as the ancients are not looked up to in them with superstitious blindness. Freed from the yoke of authority, he submitted every thing to the test of observation, and acknowledged experience alone as his guide. The French writers are with reason proud of their countryman Paré to this day: they allege, that he must ever hold amongst surgeons the same place that Hippocrates occupies amongst physicians. Nay, they add, that, perhaps, there are none either of the ancients, or moderns, who are worthy of being compared with him. (*Richerand Nosographie Chirurg. Tom.* 1.)

After the death of this great man, surgery, which owed its advancement to him, continued stationary, and even took a retrograde course. This circumstance is altogether ascribable to the contemptible state, into which those who professed the art fell, after being united to the barbers by the most disgraceful association.

Pigrai, the successor of Ambroise Paré, was far from being an adequate substitute for him. A spiritless copier of his master, he abridged his surgery in a Latin work, where the unaffected graces of the original, the sincerity, and the ineffable charm, inseparable from all productions of genius, entirely disappeared. He received, however, equal praise from his cotemporaries; doubtless, because he filled a high situation: but, as Richerand remarks, his name, which is to-day almost forgotten, proves sufficiently, that dignities do not constitute glory.

Rousset and Guillemeau distinguished themselves in the art of midwifery; while Covillard, Cabrol, and Habicot enriched surgery with a great number of curious observations. (See *Obs. Chir. pleines de remarques curieuses, Lyon*, 1639, *in 8vo. Alphabet Anatomique, Genève*, 1602, *in 4to.; and Semaine Anatomique; Question Chir. sur la Bronchotomie, Paris*, 1620, *in 8vo.*)

In the next or seventeenth century, the same impulse produced additional improvements. Then appeared in Italy Cæsar Magatus, who simplified the treatment of wounds, (*de rarâ vulnerum medicatione, libri* 2, *Venet.* 1616, *in folio*); Fabricius ab Aquapendente, even less praiseworthy as a surgeon than as a physiologist, (*Opera Chir. Paris*, 1613, *in fol.*); and Marcus Aurelius Severinus, that restorer of active surgery. (*De efficaci Medicina, libri* 3, *Francfort*, 1613, *in folio. De Recondita abscessuum natura libri* 7, *Neapoli*, 1632, *in 4to. and Trimembris Chirurgia, &c. Francfort*, 1653, *in 4to.*) Amongst the English surgeons flourished Wiseman, who was the Paré of England, (See *Several Chirurgical Treatises, London*, 1676, *in fol.*); and William Harvey, whose discovery of the circulation of the blood had such an influence over the advancement of surgery, that he must be classed among the principal improvers of this science. (See *Exercitatio Anatomica de motu cordis et sanguinis in animalibus, Francofurti*, 1653, *in 4to.*) In Germany, Fabricius Hildanus, (*Obs. et Curationum, Centuriæ* 6, 2 *vol. in 4to.* 1641.) This Fabricius was far superior to the other. Scultetus, so well known for his work entitled *Armamentarium Chirurgicum, Ulmæ*, 1653, *in folio.* Purmann and Solingen, who had the fault of being too partial to the use of numerous complicated instruments. (See *Cursæ Obs. Chir. Lipsiæ*, 1710, *in 4to. Manuale Obs. der Chirurgie; Amsterdam*, 1684, *in 4to.*)

Holland, restored to liberty by the generous exertions of its inhabitants, did not remain a stranger to the improvement of surgery. This nation, so singular in many respects, presents us with one particularity, which claims the notice of a medical historian. Ruysch, who was an eminent anatomist, and merits equal celebrity for his *Obs. Anatomico-Chirurgicarum Centuriæ, Amsterdam*, 1691, *in 4to.* carried with him to the grave the secret of his admirable injections. (See also his *Thesaur. Anat.* x *in 4to. Adversariorum anatomicorum medico-chirurgicorum Decad.* 3. *in 4to. Amsterdam.*) Roonhuysen also made a secret of his lever, which, before the invention of the forceps, was the only resource in difficult labours. Raw, who successfully cut fifteen hundred patients for the stone, took such pains to conceal his manner of operating, that Heister and Albinus, his two most distinguished pupils, have each given a different explanation of it. Such a disposition, which was extremely hurtful to the advancement of surgical knowledge, would materially have retarded the progress of surgery in Holland, had not Camper, in the following century, effaced this imputation by the great number of his discoveries, and his zealous desire to make them public.

While these improvements were going on in Italy, England, and Holland, surgery languished in a humiliated state in France: The accoucheur Mauriceau (*Traité des Maladies des Femmes grosses, Paris*, 1668, *in 4to.*) Dionis, (*Cours d'Opérations de Chirurgie, Paris*, 1707, *8vo.*), Saviard, (*Nouveau Recueil d'Obs. Chir. Paris*, 1702, *in 12mo.*) and Belloste, (*Chirurgien d'Hôpital, Paris*, 1696, *in 8vo.*) were the only French surgeons of note, who could be contrasted with so many distinguished men of other nations. Richerand observes, that the splendid days of Lewis the 14th were an iron age for discouraged surgery. And yet this monarch seems to have been personally interested in the melioration of this important art; for he was very nearly falling a victim to a surgical disease, a fistula in ano; and was not cured, till after a great number of blundering operations, and useless experiments.

Chronology teaches simply the history of dates. In the study of the sciences, the only method of impressing the memory with facts, consists in connecting the epoch of them with the learned men by whom they have been illustrated. But, the greatest surgeons of the eighteenth century have not altered the face of their profession, although they have powerfully contributed to its advancement. In surgery, as an author has remarked, some feeble rays always precede brilliant lights, and it approaches perfection in a very gradual way. In the last century, however, amongst the distinguished surgeons of France, there are two of extraordinary genius, round whom, as it were, all the others might be grouped and arranged, and whose names deserve to be affixed to the two most brilliant epochs of French surgery. These are first J. L. Petit, whose glory has been shared by the Academy of Surgery; and, secondly, the celebrated Desault.

It is not with surgery, as with physic, strictly so called: the epochs of the latter are distinguished by hypotheses; while those of surgery are marked by discoveries. The eminent men in this last branch of the profession have not, like the most renowned physicians, created sects, built systems, destroyed those of their predecessors, and constructed a new edifice, which in its turn has been demolished by other hands. All of them have been satisfied with combating ancient errors, discovering new facts, and continuing their art, the sphere of which they have enlarged by their discoveries, without making it bend under the yoke of systems, which it would have ill supported. To this steady and uniform course (says Richerand), which is a striking proof of the superiority of surgery, and of the certainty and invariableness of its principles, shall we oppose the numerous revolutions of physic? The Christian religion, which abounds in sects, has not more of them, than physic. "Naturistes, solidistes, humoristes, vitalistes, animistes, semi-animistes, mécaniciens, chimistes; le plus grand nombre des médecins honore Hippocrate d'un culte presque superstitieux; ceux-ci marchent sous les bannieres de Staahl; ceux-la s'appuient du grand nom de Böerhaave; tels autres invoquent Sydenham, Hoffmann, Stoll, absolument comme les théologiens combattent pour Luther, Zuingle, Calvin, ou Jansen." (*Nosogr. Chir. Tom.* 1.)

The elogy on J. L. Petit, delivered in the midst of the Royal Academy of Surgery, of which he was one of the first and most distinguished members, represents him as blending the study of anatomy with his amusements when a boy; and ardently seeking every opportunity to increase his knowledge by observation. He had had experience enough to publish at an early period of his life his *Traité sur les Maladies des Os, Paris* 1705, *in* 12*mo.* a work, which for a century was esteemed the best upon the subject. It may be noticed, that his success was opposed most virulently by the envious critics. It was not till after more than thirty years of academical labours and extensive practice, that he was unanimously elected as the head of his associates. This acknowledged superiority was the more flattering, as J. L. Petit obtained it at a period when surgery was in a flourishing state in France, and when he held no place from which he could derive an influence foreign to his personal merit. While Mareschal, La Peyronie, and La Martiniere assured him of the royal favour, Quesnay, Morand, and Louis, who corrected his writings, made him speak a language which does honour to that famous collection to which he contributed his observations, (see *Mémoires et Prix de l'Academie Royale de Chirurgie,* 10 *vols. in* 4*to.*) and in which, if we except some theoretical explanations, nothing has lost its value by age. In short, it will ever be considered as one of the most valuable collections of surgical knowledge.

J. L. Petit was also the author of a "*Traité des Maladies Chirurgicales et des Opérations qui leur conviennent. Ouvrage Posthume;*" a production that will always stand high in the estimation of the judicious surgeon.

The history of this epoch, so glorious for the profession of surgery, is completely detailed in the Memoirs and Prix of the Royal Academy of Surgery, a work which is absolutely indispensable, and the various parts of which cannot be too often considered. In it are preserved the labours of Le Dran, Garengeot, de la Faye, Louis, Verdier, Foubert, Hevin, Pibrac, Fabre, Le Cat, Bordenave, Sabatier, Puzos, Levret, and several other practitioners, who, though less famous, have contributed by their exertions and knowledge to form this useful body of surgical facts. The preceding surgeons also distinguished themselves by other productions.

Le Dran published:

1. *Parallèle des differentes manières de tirer la Pierre hors de la Vessie,* 1 *vol. in* 12*mo.*
2. *Opérations de Chirurgie,* 2 *vols. in* 12*mo.*
3. *Observations de Chirurgie,* 2 *vols. in* 12*mo.*
4. *Traité des Plaies d'Armes à feu,* 1 *vol. in* 12*mo.*
5. *Consultations de Chirurgie,* 1 *vol. in* 12*mo.*

Garengeot wrote:

1. *Traité des Instrumens de Chirurgie,* 2 *vols. in* 12*mo.*
2. *Traité des Operations de Chirurgie,* 3 *vols. in* 12*mo.*

Fabre was the author of

1. *Recherches sur l'Art de Guérir,* 1 *vol. in* 8*vo.*

Lecat wrote:

1. *Recueil des Pièces sur l'Operation de la Taille.*

Sabatier published the

1. *Médécine Opératoire,* 3 *vols. in* 8*vo.*

Puzos composed:

1. *Traité des Accouchemens. Paris,* 1759, *in* 4*to.*

Levret wrote:

1. *Observations sur les Accouchemens Laborieux, Paris,* 1747.
2. *Art des Accouchemens, démontré par les principes de Physique, Paris* 1761, *in* 8*vo.*
3. *Essai sur l'Abus des Regles Generales, &c. Paris* 1766, *in* 8*vo.*
4. *Observations sur la Cure Radicale des Polypes, Paris,* 1749.

To the foregoing list of eminent French surgeons must be added the names of La Motte, Mâitre-Jean, Goulard, Daniel, Ravaton, Mejean, Pouteau, David, and Frère Cosme.

La Motte published:

1. *Traité Complet des Accouchemens naturels, non-naturels, et contre nature.*
2. *Traité Complet de Chirurgie.*

Mâitre Jean was the author of

1. *Traité des Maladies de l'Œil,* 1 *vol. in* 4*to.*

Goulard wrote:

1. *Œuvres de Chirurgie, Liege* 1763, 2 *vols. in* 12*mo.*

Ravaton composed:

1. *Le Chirurgien d'armée.*

Pouteau:

1. *Melanges de Chirurgie,* 1 *vol. in* 8*vo.*
2. *Œuvres Posthumes,* 3 *vols. in* 8*vo.*

David:

1. *Observations sur la Nécrose. Paris* 1782, *in* 8*vo.*

While surgery was thus advancing in France, other nations were not neglectful of it. At this period, flourished in England, White, Cheselden, Douglas, the two Monroes, Sharp, Cowper, Warner, Alanson, Percival Pott, Hawkins, Smellie, and the two Hunters.

White's *Cases in Surgery,* 1770; Cheselden's *Treatise on the High Operation for the Stone, London* 1723, *in* 8*vo.* and his *Treatise on the Anatomy of the Human Body;* Douglas's tract, entitled, "*Lithotomia Douglassiana;*" Sharp's *Treatise of the Operations;* and his "*Critical Enquiry into the present State of Surgery;*" *Monro's Works by his son; Warner's Cases in Surgery,* 1754, *and his Description of the Eye and its Diseases,* 1775; *Alanson's Treatise on Amputation; Pott's Chirurgical Works; Smellie's Midwifery;* and *John Hunter on the Blood, Inflammation, &c.; his Treatise on the Venereal Disease; Animal Economy; the Teeth;* and all the papers written by himself and his brother, in the *Phil. Trans. Med. Obs. and Inquiries,* and *Trans. of a Society for the Improvement of Med. and Chir. Knowledge;* are productions which reflect the highest credit on the state of surgery in England.

But, of all these eminent men, none contributed more powerfully than Mr. Percival Pott, to the improvement of the practice of surgery in England. His life, indeed, forms a sort of epoch in the history of the profession. Before his inculcations and example had produced a desirable change, the maxim of "*dolor medicina doloris,*" as we learn from Sir James Earle, remained unrefuted. The severe treatment of the old school, in the operative part and in the applications, continued in force. The first principles of surgery, the natural process and powers of healing, were either not understood, or not attended to; painful and escharotic dressings were continually employed; and the actual cautery was in such frequent use, that at the times, when the surgeons visited the hospital, it was regularly heated, and prepared as a part of the necessary apparatus. Where shall we find more sensible, or more truly practical observations on the treatment of abscesses, than in his excellent treatise on the fistula in ano? Where shall we meet with better remarks on the local treatment of gangrenous parts, than in his valuable tract on the mortification of the toes and feet? What author abounds with so many just observations on injuries of the head, blended it is true with rather too great a partiality to the trepan, the so frequent necessity for which is now less generally acknowledged? His description of the inflammation and suppuration of the dura mater, and of the treatment, is matchless. The account, which he has left us of the disease of the vertebræ, attended with paralysis of the limbs, is perhaps his most original production. His celebrated essay on fractures was also very original, and has had in this country considerable influence over the treatment of these injuries; but, there can now be no doubt, that the effects of position were exaggerated in this part of his writings, and that surgeons ought still to make every possible exertion to render their apparatus for broken bones more effectual. (See *Fractures.*) A more really valuable production of this eminent surgeon is his remarks on amputation. The necessity for that operation in certain cases is there convincingly detailed; and the most advantageous period for its performance clearly indicated. The urgency for its early execution, after particular injuries, he has indeed so perfectly explained, that the late inculcations on the subject by Larrey, and several other modern surgeons, appear to be in a great measure anticipated, the only difference being that Pott's remarks applied principally to compound fractures, while Larrey's refer to gun-shot wounds. All these, however, are cases of accidental violence, and of course, must be treated upon the same general principles.

A longer comment on the writings and improvements of Percival Pott would here be requisite to do him every degree of justice; but, his name, advice, and opinions are so conspicuous throughout this volume, that I shall be excused for not saying any thing more in the present place, than that he was in his time the best practical surgeon, the best lecturer, the best writer on surgery, the best operator, of which this large metropolis could boast.

Another character of still greater genius and originality, though of inferior education, was the ever memorable John Hunter, surgeon to St. George's Hospital, who was at once eminent as a surgeon, an anatomist, a physiologist, a naturalist, and a philosopher. If Pott materially improved many parts of the practice of surgery in England, and evinced himself to be the most skilful operator of his time, John Hunter was also not less importantly employed in extending the boundaries of physiological knowledge, and in the investigation of human, and particularly comparative anatomy. The knowledge which he derived from his favourite studies, he constantly applied to the improvement of the art of surgery, and he omitted no opportunity of examining morbid bodies, by which means, he collected facts, which are invaluable, as they tend to explain the real causes of the symptoms of numerous diseases.

In the practice of surgery, whenever operations proved inadequate to their intention, Mr. Hunter always investigated with uncommon zeal the causes of ill success, and in this way, he detected many fallacies, as well as made some important discoveries in the healing art. He ascertained the cause of failure, common to all the operations in use for the radical cure of the hydrocele, and was enabled to propose a mode of operating attended with invariable success. He ascertained, by experiments and observations, that exposure to atmospherical air, simply, can neither produce, nor increase inflammation. He discovered in the blood so many phenomena, connected with life, and not to be referred to any other cause, that he considered it alive in its fluid state. He improved the operation for the fistula lachrymalis by removing a circular piece of the os unguis, instead of breaking it down with the point of a trocar. He explained better than any of his predecessors all the highly interesting modern doctrines, relative to inflammation, union by the first intention, suppuration, ulceration, and mortification. His writings also throw considerable light on the growth, structure, and diseases of the teeth. As instances of his operative skill, it deserves to be mentioned, that he removed a tumour from the side of the head and neck of a patient at St. George's Hospital, as large as the head, to which it was attached; and by bringing the cut edges of the skin together, the whole wound was nearly healed by the first intention. He likewise dissected out of the neck a tumour, which one of the best operators in this country had declared, rather too strongly, that no one, but a fool, or a madman, would meddle with; and the patient got perfectly well. But, perhaps, the greatest improvement which he made in the practice of surgery, was his invention of a new mode of performing the operation for the popliteal aneurism, by taking up the femoral artery on the anterior part of the thigh, without opening the tumour in the ham. (See *Trans. of a Society for the Improvement of Med. and Chir. Knowledge.*) The safety and efficacy of this method of operating have now been fully established, and the plan has been extended to all operations for the cure of this disease in every practicable situation. (See *Aneurism.*)

According to Sir Everard Home, Mr. Hunter was also one of the first, who taught, that cutting out the bitten part was the only sure mode of preventing hydrophobia; and he lengthened the time, in which this proceeding might be reasonably adopted, beyond the period which had been generally specified.

His researches into the nature of the venereal disease, and his observations on the treatment, will for ever make a lasting monument of his wonderful powers of reasoning and investigation. If he left some points of the subject doubtful and unsettled, he has admirably succeeded in the elucidation of others; and his work on this interesting disorder, is, with all its defects, the best which is yet extant.

Even the language and mode of expression of this great man were his own; for, so original were his sentiments, that they could hardly be delineated by any ordinary arrangement of words. His phrases are still adopted in all the medical schools of this country, and continue to modify the style of almost every professional book: whether with advantage, or not, may be doubtful. Great as Mr. Hunter's merit as a surgeon was, it was still greater as a comparative anatomist and physiologist. His museum and his papers in the Phil. Trans. will for ever attest his greatness in these characters.

At the period, when the preceding distinguished men upheld the character of their profession in Great Britain, Lancisi, Morgagni, Molinelli, Bertrandi, Paletta, Guattani, Masgagni, Matani, Troja, and Moscati, were doing the same thing in Italy. Bertrandi's Treatise on the Operations of Surgery, and Troja's work on the Regeneration of Bones, are even at this day works of the highest repute. The credit of the Italian surgeons is still honourably maintained, by Monteggia, Scarpa, Assalini, Morigi, and others. In Holland flourished Albinus, Deventer, Sandifort, and Camper; and, in Germany, and the north of Europe, the immortal Haller, Heister, well known for his "*Institutiones Chirurgiæ;*" Platner; Rœderer (*Elementa Artis Obstetriciæ. Goett.* 1752. *Obs. de Partu Laborioso. Decad* 11. 1756); Stein; Bilguer; Acrell; Callisen; (*Principia Systematis, Chirurgiæ Hodiernæ,* 2 *vol.* 8vo.); Brambilla; Theden (*Progrès ulterieurs de la Chirurgie*); Schmucker, (*Vermischte Chirurgische Schriften,* B. 3. *and Chir. Wahrnehmungen;*) Richter; (*Traite des Hernies,* 2 *vol. in* 8vo. *Bibliotheque de Chirurgie; Anfangsgr. der Wundarzneykunst.* 7 *vol.* and *Obs. Chirurgicarum Fasc.*) Also Arnemann, Weidmann, Beer, Soemmering, Creutzenfeldt, Hesselbach, Hufeland, &c. should not be forgotten, several of whom are still pursuing their useful and honourable career.

On the continent, the Academy of Surgery at Paris was long considered quite as the solar light of this branch of science. The French Revolution, which, by a fatal abuse, involved in the same prohibition, both useful and pernicious societies, did not spare even this beneficial establishment, Although the Academy was deprived of the talents of M. Louis, who died a short time before its suppression, it yet had at this period several members, worthy of continuing its labours and supporting its reputation; Sabatier, Desault, who may be regarded as the Pott of France, Chopart, Lassus, Peyrilhe, Dubois, Percy, Baudeloque, Pelletan, Sue, &c.

Desault wrote:

1. *Journal de Chirurgie; 4 vol.* 8vo.
2. *Œuvres Chirurgicales, recueillies par Bichat, 3 vols.* 8vo.

Chopart:

1. *Traite des Maladies des Voies Urinaires, 2 vols. in* 8vo.

Percy:

1. *Pyrotechnie Chirurgicale, &c.*

Baudeloque:

1. *Traite des Accouchemens, 2 vols. in* 8vo.

The Academy of Surgery in France was succeeded by what is named the Ecole de Médécine. Desault, who was almost a stranger in the former, became quite the leading character in the latter. Several things recommended him strongly to the remembrance and admiration of posterity; the exactness and method, which he introduced into the study of anatomy: the ingenious apparatuses which he invented for the treatment of fractures: a noble ardour in his profession, which he knew how to impart to all his pupils: his clinical lectures upon surgery, which were the first ever delivered: and the boldness and simplicity of his modes of operating. Indeed, such was his genius, that even when he practised only methods already understood, he did them with so much adroitness, that he rather appeared to be the inventor of them. From the Ecole de Médécine have issued Boyer, Richerand, Dubois, Lheritier, Manoury, Lallemant, Petit de Lyon, Bichat, &c.

The researches of Bichat, who quitted surgery, powerfully contributed to the advancement of physiological science. His mind, richly stored with the positive facts which he had learned in the study of surgery, conceived no less a project, than that of rebuilding the whole edifice of medicine. Some courses of lectures upon the materia medica, internal clinical medicine, and morbid anatomy, announced this vast design, which was frustrated by a premature death. Bichat, as a physiologist, and man of very original genius, may be considered as the John Hunter of France; but his qualities were of a different cast, and hardly admit of comparison with those of Hunter, whose investigations were not limited to man, but extended to the whole chain of animated beings. Bichat died in the midst of his labours, and in dying his greatest regret was that of not having completed them. His example, says Richerand, proves most convincingly what Boerhaave always inculcated, how indispensable the study and even the practice of surgery are to him, who would wish to be a distinguished and successful physician. (*Nosogr. Chir. Tom.* 1, *p.* 25.)

Perhaps, nothing contributed so materially to the improvement of surgical knowledge, as the establishment of the Royal Academy of Surgery in France; a noble institution, which, for a long while, gave our neighbours infinite advantage over us, in the cultivation of this most useful profession. Indeed, every one, truly interested in the improvement of surgery, cannot fail to regret the discontinuance of a society, in which emulation and talents were so long united for the benefit of mankind. The various dissertations, published by the illustrious members of the academy, will serve as a perpetual memorial of the spirit, ability, and success, with which the objects of the institution were pursued; and centuries hence, practitioners will reap from the pages of its memoirs the most valuable kind of surgical information. Unfortunately, this establishment, which was overthrown by the agitation of the French Revolution, has had only a very inferior substitute in the Ecole de Médecine.

Were I to name any one thing, which, in my opinion, would have the greatest influence in giving life to the study and cultivation of surgery in this country, I should without hesitation assign such importance to the establishment of an institution in the metropolis, on the same grand, liberal, and encouraged plan, as the late Royal Academy of Surgery in France.

At the same time, I am conscious, that the present Medical and Chirurgical Society of London have every claim to the encouragement and gratitude of the profession. No other institution of the kind has ever done so much in so short space of time. Many of the facts, which they have collected and published, are of considerable importance, especially those relating to the subjects of aneurism and hemorrhage. Their library is already the most select, valuable, and complete, collection of medical literature in Great Britain; and it is daily receiving additions both by large purchases at home and abroad, and by the liberal donations of its members. The intercourse and correspondence, which such a society continually maintain amongst the innumerable scattered members of the profession, cannot fail to be attended with the most beneficial consequences. A generous and useful sort of emulation is thus kept alive; the spirit of enquiry is prevented from slumbering; and every individual who ascertains a new fact, has now the means of making it known to the world, with all the expedition, which its importance may demand.

Within the last twenty, or thirty years, most important improvements have certainly been made in almost every branch of surgery; and it must gratify every Englishman to find, that his own countrymen have acted a very leading part in effecting an object, in which the interests of mankind are so deeply concerned.

Before the time of Mr. John Hunter, our ideas of the venereal disease were surrounded with absurdities; and it is to this luminary that we are in an eminent degree indebted for the increased discrimination and reason, which now prevail, both in the doctrines and treatment of the complaint. It must be confessed, however, that much yet remains to be made out, respecting the nature and treatment of syphilitic disorders. Need I mention a greater proof of the truth of this remark, than the sudden change of practice recently introduced into some of the principal hospitals in London, mercury being now not exhibited in more than one out of ten cases, for which this medicine a few years ago was always deemed indispensable? Numerous cases, having all the characters of primary venereal sores, seem now to be curable by simple dressings and cleanliness. In short, so different is every thing from what it used to be, that one is almost tempted to suppose the nature of the venereal disease totally altered. Some observations on this important topic are offered in another place. See *Venereal Disease.*

Strictures in the urethra, an equally common and distressing disease, were not well treated of before Mr. Hunter published on the venereal disease; and the advantage of armed bougies in the treatment of certain cases has been subsequently pointed out by Sir Everard Home.

Ruptures, those common afflictions in every country, have received in modern times, highly interesting elucidations from the labours of Pott, Camper, Richter, A. Cooper, Hey, Gimbernat, Hesselbach, Scarpa, Lawrence, &c.

The treatment of injuries of the head has been materially improved by Quesnay, Le Dran, Pott, Hill, Desault, and Abernethy.

The disease of the vertebra, which occasions paralysis of the limbs, formerly always baffled the practitioner; but, the method, proposed by Mr. Pott, is now frequently productive of considerable relief, and sometimes of a perfect cure.

The mode of treating lumbar abscesses has been rendered much more successful, than formerly, and, for this change, the world is indebted to Mr. Abernethy.

The almost infallible plan of curing hydroceles by an injection, as described by Sir James Earle, may also be enumerated amongst the recent improvements.

The increasing aversion to the employment of the gorget in lithotomy, and the many distinguished advocates for the use of better instruments in this operation, may be hailed as propitious omens of beneficial changes in this part of practice.

The diseases of the eyes, to which affections English surgeons seemed to pay much less attention, than was bestowed by foreign practitioners, now obtain due attention in this country. Although we have generally had some distinguished oculists, our regular surgeons have generally been wonderfully ignorant of this part of their profession, and uninformed on the subject, they have given up to professed oculists and quacks one of the most lucrative and agreeable branches of practice. However, the able writings of Daviel, Wenzel, and Ware, begin now to be familiarly known to practitioners: and the observations of Scarpa, Richter, Beer, Wardrop, and Saunders, will soon have immense effect in diffusing in the profession a due knowledge of the numerous diseases, to which the organs of vision are liable. As likewise the generality of the hospital surgeons in London have, during the last thirty years, grossly neglected the study of the diseases of the eye, and conscientiously refused to have any thing to do with these cases, the public at length saw the necessity of establishing Eye Infirmaries, where such afflictions might be more attentively observed and relieved. Some of these have now become excellent schools, in which the rising generation of surgeons have abundant opportunities of studying the nature of all the diseases of the eyes, and the most approved methods of treatment.

While, however, I am thus commending separate institutions for disorders of the eye, it becomes me to express my regret for the long continued neglect, and the ignorance of these diseases, manifested by several hospital surgeons, which were in fact the original causes of those distinct establishments. For, according to my conceptions, it would have been far better to have had the practice in eye-cases exhibited in the common great schools of surgery, the large hospitals of London. I am of this opinion, not only because I think these diseases would then have met with more general and public observation; but, also because I have always considered all unnecessary subdivisions of practice, in short all measures which tend to throw particular cases, into the hands of a few individuals, hurtful to the best interests, and degrading to the character of the profession.

In the treatment of aneurismal diseases, English surgeons have much to be proud of. All the boldest operations in this branch of surgery have been devised by the genius, and executed by the spirit and skill of British surgeons. Even M. Roux himself is here obliged to confess our superiority. (*Parallèle de la Chirurgie Angloise, &c. p.* 249.) The carotid artery, the external and internal iliac, and the subclavian, have all been successfully tied by surgeons of this country. The first operation, in which the external iliac was tied, I was a spectator of: it was performed by Mr. Abernethy in Bartholomew's hospital, and it has subsequently been repeated in many examples, both in this country and others, with considerable success. I had the honour of seeing the same gentleman likewise tie the carotid, in the first instance of that operation in England. This important measure has also now been frequently practised with success, and it constitutes one of the great modern improvements in the operative part of surgery.

In the article Aneurism, I could have cited many other examples, in which the carotid artery has been successfully tied; but, the safety and propriety of the operation are now so generally known and acknowledged, that more facts of the same kind appeared superfluous. Indeed, so little are surgeons now afraid of the ill effects upon the brain, that the carotid artery has lately been tied merely for the purpose of enabling the operator to take away a large tumour, including the whole of the parotid gland, from the side of the neck, without risk of hemorrhage. This mode of proceeding was adopted by Mr. Goodlad, surgeon at Bury, in Lancashire. (See *Medico-Chir. Trans. Vol.* 7, *p.* 112.) Before I quit this subject, my feelings call upon me to express the high opinion which I entertain of Mr. Hodgson's Treatise on the Diseases of Arteries and Veins, published in 1815, a work, which reflects great credit on English surgery, and contains practical precepts far superior to those of the immortal Scarpa.

In the modern practice of surgery, a variety of old prejudices are gradually vanishing. Peruvian bark, not many years ago, was regarded as a sovereign remedy and specific for nearly all cases of gangrene; and in these and many other instances, it was prescribed without any discrimination, and in doses beyond all moderation. But, the false idea, that this medicine has any specific effect in checking mortification, no longer blinds the senses of the most superficial practitioner. He neither believes this doctrine, nor the still more absurd opinion, that strength can be mysteriously extracted from this vegetable substance, and communicated to the human constitution, in proportion to the quantity, which can be made to remain in the stomach. This subject, however, we have duly discussed in the articles *Cinchona* and *Mortification*.

The removal of this deeply rooted prejudice, concerning the virtues of bark, in stopping mortification, will pave the way to better and more successful practice.

But, upon the subject of mortification the present day opens to us the investigation of a point, which is of the first-rate consequence. Every surgeon is aware, that when a limb is affected with mortification, amputation is absolutely necessary to effect a cure. This is generally acknowledged; but, the performance of the operation has since the time of Mr. Pott, only been sanctioned when the mortification has manifestly ceased to spread, and a line of separation is formed between the dead and living parts. All other instances, in which the disorder was in a spreading state, were left to their fate. It is true, some of the old surgeons occasionally ventured to deviate from this precept; but, as they did so, without any discrimination, or knowledge of the particular examples, which ought to form an exception to the general rule, their ill success cannot constitute a just argument against the plan of amputating earlier in a certain description of cases.

Now, if modern experience can prove, that many lives may be saved by a timely performance of amputation, under circumstances, in which it has until lately been generally condemned, we must allow, that the established innovation will be one of the greatest improvements in the practice of the present time.

For reviving the consideration of this question, and venturing to deviate from the beaten path, the world is much indebted to that eminent military surgeon, M. Larrey. How different his doctrines and practice are from those usually taught in the schools, the article *Mortification* will sufficiently prove.

In the treatment of ununited fractures, the simple and ingenious practice, proposed by Dr. Physic of Philadelphia, merits particular notice, not only on account of the several successful trials, which have been made of it in this country and France; (See *Medico-Chir. Trans. Vols.* 5 & 7, and *Boyer's Traité des Maladies Chir.*) but also because it is perhaps the first improvement that has hitherto been made in the practice of surgery by our transatlantic brethren.

The inestimable treatise of Dr. Jones on Hemorrhage has now produced quite a revolution in all the principles, by which the surgeon is guided in the employment of the ligature for the stoppage of bleeding and the cure of aneurisms. Instead of thick clumsy cords, small firm silks, or threads, are now generally used; and so far is the practitioner from being fearful of tying arteries too tightly, lest the ligature cut through them, that it is now a particular object with him to apply the silk, or thread, with a certain degree of force, in order that the inner coat of the vessel may be divided. If this be not done, the effusion of coagulating lymph, within the artery, an important part of the process of obliteration, cannot be expected as a matter of certainty, and secondary hemorrhage is more likely to occur. But, in order to convey an adequate idea of the beneficial changes, which Dr. Jones's observations are tending to produce in practice, we have been careful in the article, *Hemorrhage*, to give a tolerably full account of the results of all his interesting experiments.

Besides using very small, firm, round threads, instead of large, flat tapes, or cords, as was the custom, a few years ago, modern surgeons begin to suspect, that much benefit may also arise from cutting off both portions of the ligature close to the knot, after amputations, the removal of the breast, &c. No one has insisted so much as Mr. Lawrence upon the propriety of examining further the merits of this innovation. If no bad effects result from leaving so small a particle of extraneous substance in the flesh, as the little bit of silk composing the knot and noose on the artery, the practice will form a considerable improvement. The wound may then be brought together at every point; the quantity of extraneous matter in the wound will be lessened to almost nothing; the danger of convulsive affections will be lessened in proportion as a serious cause of pain and irritation is diminished; and the chance of accomplishing perfect union by the first intention will be materially increased. Mr. Lawrence has tried the plan in many instances, and hitherto his experience has not found any ill consequences follow, while it has proved, that many advantages are undoubtedly the result of it. I lately saw this gentleman follow this plan after an operation for femoral aneurism, and he mentioned to me some time ago a case, in which after an operation for popliteal aneurism done by a friend of his in the country, the ends of the ligature were cut off, and the wound united by the first intention. In amputations, the method has been practised by several of our military surgeons; and, although they have probably not employed exactly such ligatures as this mode absolutely requires, the greater part of them have met with hardly any instances of future trouble from the bits of ligature enclosed in the wound. However, if large ligatures be used, the practice is not fairly tried, or rather the practice is not tried at all; because the great principle, on which it answers, is the very small atom of silk composing the extraneous substance, left in the wound, when such ligatures as Mr. Lawrence recommends, are left in the wound. M. Delpech, of Montpellier, and M. Roux of Paris, have also sometimes adopted the new plan of removing the ends of the ligature close to the knot. (See *Parallèle de la Chir. Angloise avec la Chir. Françoise, p.* 131.) See *Hemorrhage* and *Ligature*.

Amongst other real improvements in modern practice, we must not forget the present more rational method of dressing the wound, after the majority of capital operations, with light, cooling applications, instead of laying on the part a farrago of irritating pledgets and plasters, and a cumbersome mass of lint, tow, flannel and other bandages, woollen caps, &c. The fewer the adhesive strips are the better, if they only hold the lips of the wound together. This is all they are intended to do. Whereas, if you apply more than are necessary for this purpose, they do harm by heating the part, and covering the wound so entirely as to prevent the issue of the discharge. Over the adhesive plasters, let the surgeon be content with placing a simple pledget of spermaceti cerate, and some linen wet with cold water, which will often avert hurtful degrees of pain, and inflammation, by keeping the parts cool.

Wars, which are unfavourable to most other sciences, are rather conducive to advances in surgery. The many new and interesting observations, which M. Larrey has made in the course of his long and extensive military experience, are a proof of what we have been remarking. Pitard, almost the founder of surgery in France, was a military surgeon. Ambroise Paré and Wiseman also collected their most valuable knowledge principally in the service of the army. Mr. Hunter himself gained much of his practical information in the same line of life. To M. Larrey we are indebted for many highly important observations, relating to amputation in cases of gunshot-wounds. In particular, he has adduced a larger and more convincing body of evidence, than was ever before collected, to prove, that, in gunshot injuries, the operation of amputation should always be performed without the least delay, in every instance, in which such operation is judged to be unavoidable, and the ultimate preservation of the limb either impossible, or beyond the scope of all rational probability. He has established the truth of this most important precept in military surgery by innumerable facts, drawn chiefly from his own ample experience, and partly from the practice of many able colleagues. The great operations of the shoulder-joint, and hip-joint amputations, he has executed with success. The necessity for the former, however, he proves may sometimes be superseded, and the limb be saved, by making a suitable incision for the extraction of the splintered portions of the upper part of the humerus. This method, which was in many instances done with success in the peninsular war, was, we believe, originally proposed and practised by M. Boucher. (See *Mem. de l'Acad. de Chir. Tom.* 2, 4to.) It was, however, more particularly described and even practised by Mr. C. White, of Manchester. (See his *Cases in Surgery.*) Lately, it has been repeated with success by Mr. Morell in the York Hospital. (See *Medico-Chir. Trans. Vol.* 7.) See *Amputation.*

Amputation at the hip-joint, performed only in the most dreadful cases, because itself the most dreadful operation in surgery, M. Larrey has performed five times, and twice, (we believe) with success. This proceeding has also been adopted by Mr. Brownrigg, staff surgeon, and Mr. Guthrie, Deputy Inspector of Military Hospitals, who in this way effected two recoveries. All these gentlemen, however, have had failures, and their successful attempts bear only a small proportion to the large number of deaths, known to have followed amputation at the hip in the many cases, in which it has now been undertaken We have no doubt, on the whole, that examples do occur, in which this severe operation is the only means, affording a chance of life; but, we deem the chance so small, that, it is to be hoped, no surgeons will perform it, except under the authority of the united opinion of a board, or consultation, of the best informed practitioners, whom circumstances will allow to assemble. See *Amputation.*

In military surgery, the useful innovation of *ambulances*, or light caravans, furnished with a proper number of surgeons assistants and orderlies, and capable of keeping up with the van-guard, if requisite, is undoubtedly the best means of affording speedy surgical assistance to the wounded on the field of battle, and ought to be enumerated as one of the greatest modern improvements.

The French surgeons-general, Barons Percy and Larrey, deserve the chief praise for their successful exertions in organizing and bringing to perfection so indispensable an establishment. Although we have hitherto had no arrangement of this kind in our armies, and it is not likely to be made in the present time of peace and economy, I have not the slightest doubt of its taking place at some future period. I also feel authorized in stating, that the want of a small corps of men, trained for the assistance of the medical staff officers, both in the field and general hospitals, was what was seriously felt in the late campaigns in the Netherlands and France. The account of the subject well deserves perusal; and it may be seen either in *Larrey's Mémoires de Chirurgie Militaire*, or in the *Dict. des Sciences Medicales, Tom.* 5.

**SUSPENSORY.** A bandage for supporting the scrotum; a bag-truss. Bandages of this kind are now usually sold at the shops, and seldom made by surgeons themselves; therefore, a particular description of them is not essential in this work In cases of hernia humoralis, varicocele, cirsocele, some particular ruptures, and several other affections of the testicle, and spermatic chord, a suspensory bandage is of infinite service.

**SUTURES.** (from *suo*, to sew.) A suture, in surgery, means a mode of uniting the edges of a wound, by keeping them in contact with stitches.

Mr. Sharp remarks, that "when a wound is recent, and the parts of it are divided by a sharp instrument, without any further violence, and, in such manner, that they may be made to approach each other, by being returned with the hands, they will, if held in close contact for some time, reunite by inosculation, and cement, like one branch of a tree ingrafted on another. To maintain them in this situation, several sorts of sutures have been invented, and formerly practised, but the number of them has, of late, been very much reduced. Those now chiefly described are the *interrupted*, the *glover's*, the *quilled*, the *twisted*, and the *dry*, sutures; but, the interrupted and twisted are almost the only useful ones, for the quilled suture is never preferable to the interrupted; the dry suture is ridiculous in terms, since it is only a piece of plaster, applied in many different ways, to reunite the lips of a wound; and the glover's, or uninterrupted stitch, which is recommended in superficial wounds, to prevent the deformity of a scar, does rather, by the frequency of the stitches, occasion it, and is therefore to be rejected, in favour of a compress and sticking plaster." (*Oper. of Surgery.*) The twisted suture is described in speaking of the *harelip;* and *gastroraphe*, which also properly belongs to the present subject, forms a distinct article in this Dictionary.

### INTERRUPTED SUTURE.

The wound being cleansed from all clots of blood, and its lips being brought evenly into contact, the needle, armed with a ligature, is to be carefully carried from without, inwards to the bottom, and so on from within outwards. Care must be taken to make the puncture far enough from the edge of the wound, lest the ligature should tear quite through the skin and flesh. This distance, according to Mr. Sharp, may be three, or four-tenths of an inch. The other stitches required are only repetitions of the same process. The threads having been all passed, you are in general to begin tying them in the middle of the wound; though, if the lips be held carefully together, (says Mr. Sharp,) it will not be of great consequence, which stitch is tied first. (See *Operations of Surgery, Chap.* 1.)

Surgical writers in general state, that

the number of stitches must, in a great measure, depend upon the extent of the wound. The common rule is, that one suture is sufficient for every inch of the wound; but, that, in some instances, a stitch must be more frequently made, particularly when a wound gapes very much, in consequence of a transverse division of muscles. As we have already explained, it is necessary to pierce the skin, at a sufficient distance from the sides of the wound, lest the thread should cut through the flesh in a short time: but, though Mr. Sharp lays down the necessary distance, in general, as three, or four-tenths of an inch, and others advise the needle to be always carried through the deepest part of the wound, we must receive these directions, particularly the last, as subject to numerous exceptions. When a wound is very deep, it would be conspicuously absurd, and even, in many instances, dangerous, to drive the needle through a vast thickness of parts. Other wounds, of considerable length, might not be, in some places, four-tenths of an inch deep; though it is true, sutures could never be requisite at such points.

The needles for making the interrupted suture will pass, with the greatest facility, when their shape corresponds exactly with the segment of a circle, and they should always form a track of sufficient size to allow the ligatures, which they draw after them, to pass through the flesh with the utmost ease.

The interrupted suture obviously receives its name from the interspaces between the stitches; and it is the one most frequently employed. Its action is always to be assisted, and supported, either with the uniting bandage, (see *Bandage*,) or with strips of adhesive plaster, compresses, &c.

### QUILLED SUTURE.

As Mr. John Bell has observed: "when the wound was deep among the muscular flesh, the old surgeons imagined, that so large a wound could not be commanded by the common interrupted suture, however deep the stitches might be driven among the flesh; they were, besides, fearful of using the continued (glover's) suture in deep gashes, lest the wound should be made to adhere superficially, while it was still open within, forming perhaps a suppuration, or deep collection of matter. They believed, that a deep muscular wound could not be safely healed, without a degree of suppuration; while they wished to bring it together at the bottom, they were afraid to close it very exactly at the mouth, lest the matter should be collected in the deeper parts of the wound; it was, for this purpose (says Mr. John Bell) that they used, what they called the *compound*, or *quilled suture.* It is merely the interrupted suture, with this difference, that the ligatures are not tied over the face of the wound, but over two quills, or rolls of plaster, or bougies, which are laid along the sides of the wound. In performing this suture, we make first two, three, or four stitches, of the interrupted suture very deep, and then, all the ligatures being put in, we lay two bougies along the sides of the wound, then slip one bougie into the loop of the ligatures on one side, drawing all the ligatures from the other side, (Mr. Bell should rather have said towards the other side,) till that bougie is firmly braced down. Next we lay the other bougie, and make the knots of each ligature over it, and draw it also pretty firm; and thus the ligatures, in form of an arch, go deep into the bottom of the wound, and hold it close, while the bougies, or quills, keep the middle of the wound, and lips of it pressed together with moderate closeness, and prevent any strain upon the threads, or any coarse and painful tying across the face of the wound." In a note Mr. J. Bell says, that Dionis violently reprobates the quilled suture; but, that De la Faye (the annotator on Dionis) says, it is good for deep muscular wounds. The quilled suture is now scarcely ever employed; nor has it any advantages, except, perhaps, in some wounds of the belly. (See *Principles of Surgery, Vol.* 1, *p.* 50.)

I think the reader will more easily comprehend the manner of making the quilled suture, by directing it to be done as follows: Take as many needles, as stitches intended to be made; arm them with a double ligature, or one capable of being readily split into two; introduce the ligatures through the wound; cut off the needles; lay a piece of bougie along one side of the wound, and tie the ends of the ligatures over it. Next draw the other extremities of the ligatures, so as to bring the first piece of bougie into close contact with the flesh; lay the second piece of bougie along the opposite side of the wound, and tie the other ends of the ligatures over it, with sufficient tightness.

### GLOVER'S SUTURE.

This had also the name of the continued suture. It was executed by introducing the needle first into one lip of the wound, from within outwards, then into the other in the same way; and, in this manner the whole track of the wound was sewed up.

The glover's suture has long been rejected by all good surgeons, as improper to be employed in cases of common wounds. It was not, however, till very lately, that this suture was totally abandoned; for, Mr. Sharp, and several eminent writers, since his time, have advised its adoption in wounds of the stomach and intestines. From what we have said in the articles *Wounds of the Abdomen*, and *Hernia*, the reader will perceive, that even in such particular instances, the glover's suture would not be advisable; so that it may in every point of view, be now considered as totally disused in every case of surgery, which can possibly present itself. When we remember, in making this suture, how many stitches are unavoidable; how unevenly, and in what a puckered state, the suture drags the edges of the skin together; and what irritation it must produce; we can no longer be surprised, at its now being never practised on the living subject. It is commonly employed for sewing up dead bodies; a purpose for which it is well fitted; but, for the honour of surgery, and the sake of mankind, it is to be hoped, that it will never again be adopted in practice.

### FALSE OR DRY SUTURE.

This term signifies the retaining of the edges of wounds in contact, by means of sticking plaster, in various manners, and the expression, as Mr. Sharp has justly remarked, is highly ridiculous, as no kind of sewing is concerned with the method. The proper plan of dressing wounds with adhesive plaster, is detailed in describing the treatment of incised wounds. (See *Wounds.*) Besides the common way of using strips of sticking plaster, some surgeons have been partial to little particularities. M. Petit used adhesive plasters, which had in the middle, one, or two holes, or even more according to the extent of the wound. Such openings enabled the surgeon not only to see, whether the edges of the wound were in accurate contact, but also in what state they were; and the apertures afforded an opportunity for applying to the wound such remedies, as were deemed expedient. However, as when common strips of adhesive plaster are properly applied, there should generally be left a certain uncovered interspace, between every two, Petit's plan had no particular advantage in this respect.

Another method was to take two pieces of adhesive plaster, of a breadth and length proportioned to the extent and depth of the wound. Three, or four ligatures, or tapes, were then fastened to one of the edges of each piece of plaster. Both pieces were then warmed, and put on the skin, along the sides of the wound. Then the edges of the cut were evenly brought into contact, and held so by an assistant, until the surgeons confined them permanently in this position, by tying each two corresponding ligatures, or tapes. A pledget was next applied over the wound, and a longitudinal compress over each plaster. Over these, a large square compress was put, and the whole of the dressings were covered, and supported with a bandage. The following day, it was usual to inspect the wound, and if the ligatures seemed lax, they were tightened; but, if in a proper condition, they were not meddled with. Sometimes, when much inflammation and swelling had come on, the ligatures were loosened; and, when these symptoms had abated, the ligatures were tightened again, if necessary.

### REMARKS ON THE EMPLOYMENT OF SUTURES.

Sutures, by which I mean such as were made with a needle and ligature, were much more frequently employed by the old surgeons, than they are by the moderns. All the best practitioners of the present day, never resort to this method of holding the sides of a wound in contact, except in cases, in which there is a real necessity for it, and other modes will not suffice.

There were, indeed, certain instances, in which the employment of sutures was long ago forbidden. Of this kind were envenomed wounds, in which accidents, the destruction of the poison always formed a principal indication in the treatment.—Wounds, accompanied with considerable inflammation, were not deemed proper for the use of sutures, as the stitches had a tendency to increase the inflammatory symptoms. Also, as contused wounds necessarily suppurated, and, consequently, could not be united, sutures were not recommended for them; nor were they judged expedient for wounds, attended with such a loss of substance, as prevented their lips from being placed in apposition. Wounds, penetrating the chest, were not united by sutures; nor were those, in which large blood-vessels were injured; at least, until all danger of hemorrhage was removed by such vessels being tied.

Dionis believed, with several other authors, that wounds should not be united, when bones were exposed, on account of the exfoliations, which might be expected. This precept is no longer valid; for, when bones are neither altered, nor diseased, and are only simply denuded, or divided with a cutting instrument, no exfoliations will commonly follow, if the surgeon take care to replace the fresh cut soft parts, so as to cover the exposed portion of the bone. The practicableness of uniting wounds, attended with the division of a bone, is confirmed, by numerous facts. M. de la Peyronie communicated to the Academy of Surgery, in France, a case, which is very conclusive on this point. A man was wounded with a cutting instrument, in an oblique direction, on the external and middle part of the arm. The bone was completely cut through, together with the integuments and muscles; in such a manner, that the arm only hung by an undivided portion of the skin, about an inch wide, under which were the large vessels. M. de la Peyronie tried to unite the parts, being convinced, that it would be time enough to amputate afterwards if the case should require it. He placed the two extremities of the divided bone in their natural situation; made several sutures for promoting the union of the soft parts; and applied a bandage to the fracture. In this bandage, there were slits, or apertures, over the wound, to allow the dressings to be applied. Spirit of wine, containing a little muriate of ammonia, was used as a topical application, and the fore-arm, and hand, which were cold, livid, and insensible, were also fomented with the same. By these means, the natural warmth was restored, and the wound was dressed. In a week, the dressings were removed, through the opening in the bandage; in a fortnight, they were changed, a second time, and the wound seemed disposed to heal. On the eighteenth day, the healing had made progress; the part had a natural appearance; and the beating of the pulse was very perceptible. M. de la Peyronie now substituted a common roller, for the preceding kind of bandage. Care was taken to change the dressings, every ten days. In about seven weeks, all applications were left off, and, at the end of two months, the patient was quite well, with the exception of a little numbness in the part. This case is one of the most important in all the records of surgery; for, it displays, in a most striking manner, what very bad wounds it is the duty of the surgeon to attempt to unite; and, above all, it shews the propriety of attempting to save many compound fractures, which, judged of only from first appearances, would lead almost any one to resort to amputation. When the divided parts, in such cases, have been put into contact, the appearances are quite altered.

From what has been already stated, it appears, that surgeons, a considerable time back, did not at once sew up every sort of wound. The best modern practitioners employ sutures much less frequently, than their predecessors. M. Pibrac's dissertation on the abuse of sutures, inserted in the third volume of the Memoirs of the Academy of Surgery, has had considerable effect in producing this change, and I may safely add, this improvement in practice. This judicious and enlightened practitioner opposed the method of uniting wounds by means of sutures, which, he contended, ought never to be adopted in practice, except in certain cases, in which it was absolutely impossible to keep the sides of the wound in contact, by the adoption of a proper posture, and the aid of a methodical bandage. Such circumstances M. Pibrac represents, as exceedingly rare, if they can occur at all. He speaks of sutures, as very seldom fulfilling the intention of the surgeon, who, in the majority of cases, in which he employs them, finds himself necessitated to remove them, before they have accomplished the wished-for end. M. Pibrac believes, that sutures are generally more hurtful, than conducive to the union of wounds; and that when they succeed, they do not effect a cure more speedily, than a proper bandage. He cites numerous cases of very extensive wounds of the abdomen, neck, &c. for the cure of which a bandage proved effectual, and this even in many instances, in which sutures had previously failed, and cut their way through the flesh. M. Louis adopted the opinions of M. Pibrac, and published, in the fourth volume of *Mem. de l'Acad. de Chirurgie*, a dissertation, in which he endeavours to shew, that the hare-lip can be better united, by means of the uniting bandage, than when sutures are used for the purpose.

As far as I can judge, the fair statement of the matter is, that sutures are by no means requisite in the generality of wounds; but, that there are particular cases, in which, either their greater convenience, or superior efficacy, still makes them approved, and employed, by all the most eminent practitioners of the present day. Since sutures cannot be practised, without making additional wounds, and occasioning pain, and since the ligatures always act as extraneous bodies in the parts, in which they are introduced, exciting more or less inflammation, and suppuration round them; there can be no doubt, that their employment is invariably wrong, whenever the sides of a wound can be maintained in contact by means less irritating. For, what is it which generally counteracts the wishes of the surgeon in such cases, and makes his attempts, to make the opposite surface of wounds grow together, prove unavailing? Is not the general cause too high a degree of inflammation, which necessarily ends in suppuration? Are not sutures means exceedingly likely to augment inflammation, both by the additional wounds of the needles, and the still more pernicious irritation of the threads, which always act as foreign bodies, sometimes producing not merely an increase of inflammation, and suppuration in their track; but, frequently, such ulceration as enables them to cut their way out, or else sloughing of the parts; or, in particular constitutions, a very extensive erysipelatous redness round the wound.

By the ulcerative process, just mentioned, sutures very often cease to have the power of any longer keeping the edges of wounds in contact; as the observations of M. Pibrac, and, indeed, what every man may daily remark in practice, fully testify. The violent inflammatory symptoms, which they excite, frequently oblige the surgeon to cut them, and withdraw them altogether.

But even admitting, that, by the general adoption of sutures, some wounds would be united, which could not be so, were this means of accomplishing an union (generally speaking) abandoned, still it must be allowed, on the other hand, that the cause of some wounds not uniting, is entirely ascribable to the irritation, occasioned by the sutures themselves. Hence, if it be only computed, that as many wounds are prevented from uniting by the irritation of sutures, as other wounds, which are united by their means, and could be united by no other methods, we must still perceive, that mankind would be no sufferers, and surgery undergo no deterioration, were sutures altogether rejected from practice. I believe, however, that every man, who has had opportunities of observation, and has made use of them, with an unprejudiced mind, will feel persuaded, that more wounds are hindered from uniting by sutures, than such as are healed by them, and, *could not be united by other* means.

But, prudent practitioners are not obliged, either to condemn or praise, the use of sutures, in every instance, without exception. Men of independent principles will always adopt the line of conduct, which truth points out to them as that which is right; nor will they obstinately side with M. Pibrac and M. Louis, in contending that sutures are always improper and disadvantageous, nor, with other bigoted persons, who may use sutures in every kind of wound whatever.

Sutures are, perhaps, still rather too much employed, and in all probability, will long be so. It will be difficult entirely to eradicate the prejudices, on which their too frequent use is founded, as long as we see, what may be called, the *Mâitres de l'Art*, holding up the practice for imitation, in every principal hospital in the kingdom. Such surgeons, however, as are ready to imbibe fair and candid sentiments on the subject, and to qualify themselves for practising this part of surgery, with judgment, should by no means neglect to read, both what M. Pibrac and M. Louis, have written on the subject. I know, that the latter authors are a little too sanguine, in their representations; but, as I have already remarked, sutures are still rather too much used, and something is yet necessary to do away a certain unwarranted habit of having recourse to them in several particular cases. Nothing will tend to produce this desirable change so much, as the perusal of every argument against their employment.

I am decidedly of opinion, not from what I have read, but what I have actually seen, that the sides of the generality of wounds are capable of being effectually kept in contact, by means of a proper position of the part, the aid of strips of adhesive plaster, and that of compresses, and bandages. I believe, that such success can be obtained, with every advantage, which can be urged in favour of sutures, and without their disadvantages; such as greater pain, inflammation, &c. I even think, with M. Louis, that the hare-lip could in general be united very well, by means of a bandage; but, still, I am of opinion, that the twisted suture is attended with least trouble, is most suited for universal practice, and, that, unless such pains were taken, as many practitioners would not, and others could never take, the method by bandage would frequently fail.

I find it exceedingly difficult to lay down any fixed principles for the guidance of the surgeon, in respect to when he ought, and when he ought not to use sutures.

Perhaps, sutures should be made use of, for all cuts and wounds, which occur in parts, which are subject to an unusual degree of motion, such as would be apt to derange the operation of bandages, sticking plaster, and compresses. Hence, the propriety of using the twisted suture for the hare-lip.

Sutures are probably, for the most part, advantageous, in all wounds of the abdomen, of a certain length and attended with hazard of the viscera making a protrusion. In this situation, the continual motion and action of the abdominal muscles, in carrying on respiration, besides the tendency of the viscera to protrude, may be a reason in favour of the use of sutures.

When two fresh-cut surfaces positively cannot be brought into contact, by sticking plaster, bandages, the observance of a proper posture, &c. there can be no doubt of the advantage of using sutures, if they will answer the purpose. Some wounds of the trachea; some wounds made for the cure of certain fistulous communications between the vagina and bladder; or others for the cure of similar affections in the perinæum; afford instances of cases, to which I allude.

I observe, that many of the best operators in this metropolis, use sutures for bringing the sides of the wound together after several operations; such as that of removing a diseased breast; castration; and operations for strangulated hernia.

The reason for using sutures in the scrotum, I suppose, arises from the difficulty of keeping the edges of the wound in contact, owing to the great quantity, and looseness of the part. I cannot pretend to determine, whether, in this case, sutures are really necessary, or not: but, after the amputation of the breast, I have no hesitation, in pronouncing their employment wrong and injudicious.

I shall conclude with referring to what M. Pibrac and M. Louis have written on the above subjects, in *Mem. de l'Acad. de Chir. tom.* 3 *&* 4. *Sharp, Dionis, Gooch, Le Dran, Bertrandi, Sabatier, B. Bell, and J. Bell, have all treated of sutures.*

**SYMPATHETIC BUBO.** (See *Bubo.*)

**SYNCHYSIS.** (from *συγχυω*, to confound.) According to Saint-Yves, and Mâitre-Jan, a kind of suppuration in the situation of the vitreous and crystalline humours. The term *synchysis* now more commonly denotes the confusion of the humours of the eye, occasioned by blows, and attended with a rupture of the internal membranes, and capsules. (See *Encyclopédie Méthodique; Part. Chir. Art. Synchyse.*)

**SYNTHESIS.** (from *συν*, together, and *θεσις*, position, situation.) A generic term, formerly much used in the schools of surgery, and comprehending every operation, by which parts, which had been divided, were reunited.

**SYPHILIS.** Lues Venerea. The venereal disease. (See *Venereal Disease.*)

# T.

**T BANDAGE.** A bandage, so named from its figure. It is principally used for supporting the dressings after the operation for the fistula in ano, in diseases of the perinæum, and those of the groins, anus, &c. It is composed of two longitudinal pieces of cloth, of greater, or lesser breadth, according as occasion requires. The transverse piece of cloth serves to go round the body above the hips; the perpendicular piece is sewed, at one of its ends, to the middle of the latter; and, in general, its other extremity is slit into two portions, or tails, about six, or eight inches long. The perpendicular piece of the T bandage applies itself between the glutæi muscles, and to the perinæum; while its two ends, just described, are to be carried between the thighs, and the pudenda, to the right and left, and fastened to the transverse piece, surrounding the body. Besides the common T bandage, there is another one named *double*, which has two perpendicular pieces, sewed to the transverse one, about four inches apart. The double T bandage is said to be more particularly applicable after lithotomy, and for the diseases of the perinæum; because, one may make the two perpendicular pieces cross each other on the part affected, and leave the anus uncovered; an advantage, which the simple T bandage certainly has not. The T bandage may be used in some other ways, as we have noticed, in making mention of it in the article *Bandage.*

**TALPA.** (a mole.) A tumour, which creeps under the skin, as a mole under the surface of the ground. Such is the etymology. It is often applied to an encysted tumour, which forms on the head, and contains a paplike matter. (See *Atheroma* and *Tumours, Encysted.*)

**TAPPING.** See *Paracentesis.*

**TARAXIS.** (from *ταρασσω*, to disturb.) A slight ophthalmy, or inflammation, of the eye.

**TAXIS.** (from *τασσω*, to put in order.) The operation of reducing a hernia, with the hand. (See *Hernia.*)

**TENDO ACHILLIS.** See *Achilles, Tendon of.*

**TENT.** A roll of lint for dilating openings, sinuses, &c. (See *Spongia præparata.*)

**TEREBELLA.** (dim. of *terebra*, a perforating instrument.) A trepan, or instrument for sawing out circular portions of the skull. A trephine.

**TEREBRA.** (from *τερεα*, to bore.) A trepan, or trephine. Also an instrument called a perforator, such as is contained in the generality of cases of trephining instruments, and is used for making the hole, in which the centre pin of the trephine is to work.

**TESTICLE, DISEASES OF.** For an account of many of these affections, I must refer to distinct articles in this Dictionary; for instance, *Cirsocele, Fungus Hæmatodes, Hernia Humoralis, Hæmatocele, Hydrocele, &c.*

Mr. Pott defines *sarcocele* to be a disease of the body of the testicle, and, as the term implies, it consists in general in such an alteration made in the structure of that organ, as produces a resemblance to a hard, fleshy substance, instead of that fine, soft, vascular texture, which it naturally presents. " *Sarcocele* (says Callisen) is a name applied to every chronic swelling of the testicle, attended with a total, or partial conversion of the part into an heterogeneous substance. (*Systema Chirurgiæ Hodiernæ, Pars* 2, *p.* 144.) According to these definitions, sarcocele becomes a term admitting of almost general application to the morbid affectious of the testicle, since most of them are attended with induration, and swelling, of the part. In fact, we find, that the old writers, and a great many of the moderns, call all diseased indurations and enlargements of the testicle, *sarcoceles*, whether the disorder be a simple, chronic, indolent tumour, unaccompanied with any symptoms of specific disease, or malignancy, or whether it be a scrophulous, or, what is still more different, and more serious, a truly scirrhous, disorder of the organ. Even the fungus hæmatodes of the testicle was, until lately, often termed sarcocele.

That this vague method of employing the word sarcocele can be attended with no advantage, but, on the contrary, must have a tendency to destroy all useful discrimination, is a proposition, the truth of which is self-evident. I am well aware, that Mr. Pott, and many late writers, set out with an idea, that every sarcocele has a propensity to change into scirrhus, and actual carcinoma, and, therefore, the latter states are considered by these authors only as stages of the same disease. Indeed, it is universally admitted by the best and most experienced observers, that a common indolent sarcocele, a simple fleshy enlargement of the testicle, may change into the peculiar malignant disease, called scirrhus, or cancer. But, yet, it is by no means proved, that all the diseases, which have been comprehended under the name of sarcocele, are accompanied by a risk of their assuming the nature of scirrhus and cancer; for, nothing can be more certain, than that the enlargement of the testicle, produced by fungus hæmatodes, is, from the first to the last, always of one character, and can never change into ordinary scirrhus, or carcinoma. Neither do indolent scrophulous swellings of this organ ever undergo such an alteration, as to deserve the epithets of *scirrhous* and *cancerous*. In opposition to the belief of Mr. Hunter, (*see his Treatise on the Ven. Disease*, *p.* 59,) some surgeons still imagine, that there is really one kind of chronic enlargement of the testicle, arising from a venereal cause. (*Roux Parallele de la Chirurgie Angloise*, *&c. p.* 305; *Richerand*, *Nosographie Chir. T.* 4, *p.* 300, *Edit.* 4.) Now this also has usually been called a sarcocele; it was so named by Pott himself, and if there be such a case, no one will suppose, that it, or any other form of lues venerea, is capable of changing into a true scirrhous, or cancerous disease. Perhaps, therefore, it might be more consistent and advantageous to restrict the appellation of *sarcocele* to an indolent fleshy enlargement of the testicle, unaccompanied with any present symptoms of malignancy, or any marks of its being the effect of a specific disease; and as soon as the case evinces another character, the name should correspond with the particular nature of the disease.

We need not here enter into a minute account of the various sarcomatous diseases, to which the testicle is subject; for, they have no peculiarity in them, except what depends upon their situation, and the general characters of the different species of sarcoma will be considered in a future article. (See *Tumour.*) The testicle is especially liable to three kinds of sarcoma, which have been named by Mr. Abernethy, the *common vascular*, the *cystic*, and the *medullary*. The latter case, however, which is often called *soft cancer of the testicle*, I shall describe in the present article, in order that the reader may judge, whether there is any material difference between this case, and another distemper to which the testicle is subject. (See *Fungus Hæmatodes.*) Sometimes the testicle is converted into a truly *scrophulous* mass. It is increased in size, and when cut into, a whitish, or yellowish coagulated matter is discovered, mixed with pus. The complaint is not attended with so much pain, and induration, as a scirrhous disorder of the testicle; nor does it produce any unfavourable state of the health.

As Dr. Baillie observes, the testicle is often found converted into a hard mass, of a brownish colour, and generally intersected with membranes. Sometimes, there are cells in the tumour, which are filled with a sanious fluid. (*Morbid Anatomy*, *&c. p.* 352—353, *Edit.* 2.) This is the truly *scirrhous testicle*, which is attended with great hardness, severe pains darting along the spermatic chord to the loins, and an unequal knotty feel. In general the health becomes impaired. To use Mr. Pott's words, sometimes the fury of the disease brooks no restraint; but, making its way through all the membranes, which envelope the testicle, it either produces a large, foul, stinking, phagedenic, ulcer, with hard edges, or it thrusts forth a painful gleeting fungus, subject to frequent hemorrhage. (*Pott's Chirurgical Works*, *Vol.* 2, *p.* 390, *Edit.* 1808.) These latter states of the disease are denominated *cancer of the testicle*.

Sooner, or later, the scirrhous induration extends from the epididymis, upward along the spermatic chord, even within the abdominal ring. In the latter circumstance, the lymphatic glands in the groins usually become diseased; and this extension of mischief, together with the impossibility of removing the whole of the diseased chord, too frequently deprives the patient of every chance of getting well.

I have already stated, that some of the most simple sarcomatous enlargements of the testicle are capable of assuming, in a very sudden manner, a malignant, and cancerous tendency; and that sometimes the scirrhous induration of the chord makes a rapid progress upward. Hence, that surgeon acts with prudence, who recommends the early extirpation of every testicle, which is incurably diseased, and so deprived of its original organization, as to be totally unfit for the secretion of the semen.

Chronic enlargements of the testicle are sometimes attended with an accumulation of limpid fluid in the tunica vaginalis, and the disease is then termed, *hydrosarcocele*, an appellation first employed by Fabricius ab Aquapendente.

The hardness and swelling of the epididymis, remaining after an acute inflammation of the testicle (see *Hernia Humoralis*), do not constitute a complaint, which surgical authors class with sarcocele; for, the disease hardly ever increases so as to give trouble.

I have stated, that sarcoceles, in common with the generality of other sarcomatous tumours, may change into distempers, which, in point of malignity, and the manner in which they injure the health, are quite as bad as cancer itself. It is said, however, that sarcocele of the epididymis rarely becomes malignant, and is much more easy of cure, than the same disease of the glandular portion of the testicle; but both parts are often diseased together.

Sarcoceles sometimes continue for years, without undergoing any particular change; in other instances, they increase with surprising rapidity. The inconveniences, which they excite, often proceed chiefly from their weight and magnitude: their weight occasions an uneasy, and even a painful sensation in the loins, especially, when the patient neglects to wear a suspensory bandage, or a bag-truss for the support of the part. The danger of a sarcocele arises from the increase and extension of the hardness up the spermatic chord, and from the change of the tumour from its indolent state into a painful, ulcerated, and incurable disease.

A sarcocele sometimes bears a resemblance to hydrocele of the tunica vaginalis. It sometimes has the usual pyramidal shape of the latter disease, and, like it, is always situated at the lower end of the spermatic chord. The chief difference between the two cases seems to be, that the sarcocele is hard, while the hydrocele has a soft, yielding, elastic feel. It should be known, however, that the fungus hæmatodes of the testicle is remarkable for the deceitful feel of fluctuation and elasticity, which it presents; and every surgeon ought to be aware, that a sarcocele is not always particularly hard, and that hydroceles are sometimes exceedingly indurated. The sarcocele, indeed, is not transparent; neither is the hydrocele in certain instances; and these are cases, in which a mistake may easily be made. Still, with due attention, both diseases may be discriminated with tolerable precision. The sarcocele, when held in the surgeon's hand, seems heavier, than the hydrocele. Every part of a diseased testicle is seldom equally indurated, so that the sarcocele is usually much softer in some places, than others. The hydrocele presents the same kind of feel at every point, except behind, where the testicle is felt. When, in the case of hydrocele, pressure is made in this latter situation, the patient experiences a much more acute sensation, than when the pressure is made upon any other part of the tumour; but, in the example of sarcocele, the patient commonly has the same kind of feel, let the pressure be applied to any part of the swelling whatsoever. When the upper portion of the spermatic chord can be felt, and it seems quite hard and thickened, the surgeon has reason for suspecting the case to be a sarcocele. Lastly, though a hydrocele, when gently handled, may seem very hard, yet, on being more strongly compressed, it will generally betray a soft, elastic feel, which, excepting instances of fungus hæmatodes, is never the case with an indurated sarcocele.

It has been already explained, that a sarcocele is sometimes conjoined with a hydrocele, which case is well known amongst surgeons by the appellation of *hydro-sarcocele*. As the diseased testicle is then surrounded with fluid, it cannot be felt, nor examined by the fingers. However, when an unusual degree of hardness is perceptible at the back part of the tumour, where the testicle is situated, or when the upper portion of the spermatic chord is found to be quite indurated, there is reason for suspecting, that the testicle is diseased. The sarcocele also is commonly the original and principal complaint, the hydrocele not occurring till some time after the enlargement of the testicle.

In some unusual cases, the substance of the scrotum is converted into an indurated mass, which occasionally attains a vast size, and presents the appearance of an enormous sarcocele. An example, in which the tumour weighed 70lb. has been lately published by Dr. Titley. (See *Medico-Chir Trans. Vol.* 6, *p.* 73.) In one case, recorded by Dr. Cheston, a swelling of this kind was as large as a child's head. On dissection of the parts, the testicle and tunica vaginalis were found to be quite free from disease. The tumour proceeded entirely from an induration of the cellular membrane, which immediately covers the external surface of the vaginal coat. This curious disease is more common in warm climates, and several instances of it were met with in Egypt by M. Larrey. (See *Mem. de Chir.*

*Militaire, Tom.* 2, *p.* 110 *et seq.*) Some interesting particulars, relative to it, will be found in another part of this Dictionary. (See *Scrotum.*)

The operation of castration is the most certain means of relieving the patient from sarcocele. This measure, however, is not invariably practicable, nor is it always necessary; for, sometimes the induration of the testicle admits of being dispersed by the judicious employment of internal medicines and external applications. The hope of accomplishing this desirable object may reasonably be entertained, when the swelling is not very large, when it has not existed a considerable time, and when it is not attended with very great induration. Experience has proved, that some kinds of sarcocele have yielded to the exhibition of emetics, (*Warner, Pringle, and Home in Chemical Experiments*); to a decoction of ononis spinos. (*Bergius Mat. Med. Richter's Chir. Bibl.* 7 *B. p.* 605); to cicuta and bark (*Warner*); to mercurial frictions (*Le Dran, B. Bell, Richerand, Delpech*); to the external use of the liquor ammon. acetatis (*Richter's Chir. Bibl.* 5. *B. p.* 127); to poultices containing opium (*Fothergill, in Med. Obs. and Eng. Vol.* 5.); to a lotion made of a strong decoction of hemlock (*Warner*); to the steam of vinegar, the repeated employment of leeches, and the application of cold, &c. The operation of all these means will be advantageously assisted by the continual use of a bag-truss, the observance as much as possible of an horizontal position, and attention to a suitable low diet.

Mr. Pott believed, that the man, who has the misfortune to be afflicted with a sarcocele, has very little chance of getting rid of the disease by any plan, except extirpation; and all the time the operation is deferred, he carries about him a part, not only useless, but burdensome, and which is every day liable to become worse, and unfit for such an operation. Now, although there is a great deal of truth in this inion, yet, I conceive, it is rather exaggerated, and that it would tend to authorize the practice of castration to an extent beyond all necessity. I certainly think, with Mr. Pott, that there never was a sarcocele cured, where the organization of the testicle had been destroyed by disease, or where its structure had suffered so much as to render it incapable of the office, for which it is destined. But, such state cannot always be known by inspection, or manual examination, and were a surgeon to condemn to the knife every testicle, which he finds affected with indolent swelling and induration, he would remove many, which, under some of the above plans of treatment, might be perfectly cured. That there are some chronic enlargements of the testicle, which may be resolved, is a truth, of which experience must have convinced the generality of surgeons.

The scrophulous induration, and several other swellings of this organ, which are very imperfectly understood, may sometimes be benefited, and even entirely cured, just like some analogous affections of the breast. What is termed the *venereal sarcocele* (Mr. Pott allows) always gives way to a mercurial course properly conducted. The diagnosis of this case, it must be confessed, is not very clearly explained by surgical writers, nor was its reality acknowledged by Mr. Hunter. According to Mr. Pott, it is seldom an early symptom, and he does not remember ever to have seen an instance, in which it was not either immediately preceded, or accompanied by some other appearances plainly venereal. He adds, that it has neither the inequality, nor darting pains of scirrhus. But, the question whether the case is truly syphilitic or not, is far less interesting, than the question, whether there are not many sarcoceles, which may be diminished and cured by mercury? The affirmative cannot be questioned. I have seen many such cases myself, and there are numerous examples on record. A statement of several has been lately published by Richerand. (See *Nosographie Chirurgicale, Tom.* 4, *p.* 300 *et seq. Edit.* 4.) The authority of Delpech is also on the same side. (*Précis Elémentaire des Maladies Reputées, Chir. Tom.* 3, *p.* 564.)

Indeed, this last writer maintains, that many common sarcoceles and scirrhi of the testicle are so much alike in their symptoms, that the difference of their nature cannot always be at once detected by the practitioner. Hence, although I am an advocate for the early performance of castration in cases of sarcocele, where there is reason to suppose the disease so far advanced, that the organization of the testicle is totally destroyed; or where internal and external remedies have been tried a certain time in vain; yet, these sentiments do not incline me to recommend the operation for other examples, in which the disease is quite recent, and no plan of treatment whatsoever has been fairly tried. I have already enumerated various plans of treatment, which have been proved by experience to be sometimes capable of affording relief. The disease of the testicle, which is usually called the *scrophulous sarcocele*, like other forms of scrophula, often gets well spontaneously after a certain time, and it may frequently be considerably benefited by administering internally the conium maculatum and small doses of the submuriate of mercury; lotions of sea-water, or poultices of sea-weeds, being applied to the scrotum. Several other indolent enlargements of the testicle yield to frictions with camphorated mercurial ointment on the scrotum. The late Mr. Ramsden thought, that some sarcoceles might be relieved by removing with bougies a supposed morbid irritability of the urethra, with which his theories led him to connect the origin of the complaint. (See *Pract. Obs. on Sclerocele, &c.*) The novelty of this suggestion for a time attracted considerable notice; but, the interest, which it once excited, has now died away; a sufficient proof, to my mind, that the practice inculcated was not of much value.

From the preceding observations, it may be inferred, that all chronic enlargements of the testicle are not incurable; but, that we ought at the same time to be duly impressed with the expediency of not wasting too much time in the trial of means, which are not to be depended upon, and which, if continued immoderately long, might allow the disease to advance too far to be capable of being afterwards effectually extirpated.

The following observations, amongst others made by the celebrated Mr. Pott, on the circumstances, in which the operation of castration is advisable, or not, are highly valuable, and merit the serious attention of every surgical practitioner.

" These circumstances are of two kinds, and relate either to the general habit of the patient, and the disorders and indispositions of some of the viscera, or to the state of the testicle, and spermatic chord.

" A pale, sallow complexion, in those who used to look otherwise; a wan countenance, and loss of appetite and flesh, without any acute disorder; a fever of the hectic kind; and frequent pain in the back and bowels, are, in those who are afflicted with a scirrhous testicle, such circumstances as would induce a suspicion of some latent mischief, and incline one to suppose that the same kind of virus, which had apparently spoiled the testis, may also have exerted its malignant influence on some of the viscera; in which case, success from the mere removal of the testicle is not to be expected. They, whose constitutions are spoiled by debauchery and intemperance, previous to their being attacked with this disease; who have hard livers, and anasarcous limbs, are not proper subjects for such an operation. Hard tumours within the abdomen in the regions of the liver, spleen, kidneys, or mesentery, implying a diseased state of the said viscera, are very material objections to the removal of the local evil in the scrotum. In short, whenever there are manifest appearances, or symptoms of a truly diseased state of any of the principal viscera, the success of the operation becomes very doubtful; more especially, if such symptoms and appearances, upon being properly treated, resist in such manner, as to make it most probable, that a cancerous virus is the real cause of them. When none of these require our attention, the object of consideration is the testicle and its spermatic vessels. The state of the mere testis can hardly ever be any objection to the operation; the sole consideration is the spermatic chord: if this be in a natural state, and free from disease, the operation not only may but ought to be performed, let the condition of the testicle be what it may; if the spermatic chord be really diseased, the operation ought not to be attempted.

" All writers on this subject agree in saying, that if the spermatic process has partaken of the diseased state of the testicle, that is, has become enlarged and hardened, and such enlargement and induration extends itself quite up to the abdominal muscle, that the operation of castration ought not to be performed, because it will not only prove successless, but will hasten the death of the patient. And this is, in some degree, most certainly true; but not without some limitation. A truly and absolutely diseased state of the spermatic chord, in any part of it, is certainly a very material objection to the operation, as it most commonly proves a bar to the success of it: and a morbid state of the same chord quite as high as the abdominal muscle, that is, of all that part of it, which is external to the cavity of the belly, is a just and full prohibition against such attempt. But, on the other hand, it must be observed, that every apparently morbid alteration of the spermatic chord is not really such; and, therefore, that every enlargement, induration, fulness, &c. which seems to alter the spermatic vessels from that state, which is called a healthy and natural one, is not to be regarded as a disease; at least, not as such a disease as is sufficient to prohibit the attempt to obtain a cure by extirpation.

" When the spermatic vessels are not only turgid and full, but firm and hard; when the membrane, which invests and connects them, has lost its natural softness and cellular texture, and has contracted such a state, and such adhesions, as not only greatly to exceed its natural size, but to become unequal, knotty, and painful, upon being handled, and this state has possessed all that part of the chord, which is between the opening in the oblique muscle and the testicle, no prudent, judicious, or humane man, will attempt the operation; because he will, most certainly, not only do no good to his patient, but will bring on such symptoms as will most rapidly, as well as painfully destroy him.

" On the other hand," says Pott, " every enlargement of the spermatic chord is not of this kind, nor by any means sufficient to prohibit or prevent the operation.

"These alterations, or enlargements, arise from two causes, viz. a varicose dilatation of the spermatic vein, and a collection, or collections, of fluid in the membrane investing and enveloping the said vessels. In the first place, as there is no reason in nature why a testicle, whose vessels have previously (for some time perhaps) been in a varicose state, should not become scirrhous; so it is also clear, that the scirrhosity seizing such testicle will by no means remove, or even lessen such varicose dilatation of the vessels from which it is dependent; on the contrary, will, most probably, and indeed does most frequently, increase such distention: but such mere varicose enlargement of the vessels, whether it be previous or consequential to the morbid state of the testis, does not, nor ought to prevent the removal of it, if otherwise fit and right.

"In the next place, the diseased state of a truly scirrhous testicle, its weight, and the alteration that must be made in the due and proper circulation of the blood, through both it and the vessels from which it is dependent, may and do concur in inducing a varicose dilatation of the spermatic vein, without producing that knotty, morbid alteration and hardness, which forbid our attempts. Between these, a judicious and experienced examiner will generally be able to distinguish.

"In the former (the truly diseased state), the chord is not only enlarged, but feels unequally hard and knotty; the parts of which it is composed are undistinguishably blended together; it is either immediately painful to the touch, or becomes so, soon after being examined; the patient complains of frequent pains shooting up through his groin into his back; and from the diseased state of the membrane composing the tunica communis, such adhesions and connexions are sometimes contracted, as either fix the process in the groin, or render it difficult to get the finger and thumb quite round it.

"In the other (the mere varicose distention) the vessels, though considerably enlarged and dilated, are nevertheless smooth, soft, and compressible; the whole process is loose and free, and will easily permit the fingers of an examiner to go quite round it, and to distinguish the parts of which it is composed; it is not painful to the touch; nor does the examination of it produce, or occasion, those darting pains, which almost always attend handling a process malignantly indurated.

"The other circumstance, which I have mentioned as capable of deceiving an operator, and inducing him to believe, that the spermatic chord is much more diseased than it really is, and thereby deterring him from the performance of an operation, which might prove successful, is the extravasation, or collection of fluid in the cellular membrane enveloping the spermatic vessels, between the abdominal opening and the testis.

"In the cellular membrane, leading to a diseased testicle, it is no very uncommon thing to find collections of extravasated fluid. These, as they add considerably to the bulk, and apparent size of the process, make the complaint appear more terrible; and, as I have just said, less likely to admit relief.

"When the extravasation is general, through all the cells of the investing membrane, and the spermatic vessels themselves are hardened, knotty and diseased, the case is without remedy; for, although a puncture, or an incision, will undoubtedly give discharge to some, or even the greatest part of the fluid; yet this extravasation is so small, and so insignificant a circumstance of the disease, that the parts, in this state, are so little capable of bearing irritation, that an attempt of this kind must be ineffectual, and may prove mischievous.

"But, on the other hand, collections of water are sometimes made in the same membrane, from an obstruction to the proper circulation through the numerous lymphatics in the spermatic process, while the vessels themselves are really not diseased, and therefore very capable of permitting the operation. In this case, the fluid is generally in one cyst, or bag, like to an encysted hydrocele, and the spermatic chord, cyst and all, are easily moveable from side to side; contrary to the preceding state, in which the general load in the membrane fixes the whole process, and renders it almost immoveable.

"A discharge of the fluid will, in this case, enable the operator to examine the true state of the process, and, as I have twice or thrice seen, put it into his power to free his patient from one of the most terrible calamities which can befal a man." (See *Pott on Hydrocele, &c.*)

The testicle is subject to a disease often called *soft cancer*, which, though of a very malignant and incurable nature, is different from the true cancer, already described. It has been particularly noticed by Mr. Abernethy, under the name of *Medullary Sarcoma.* In most of the instances, which this gentleman has seen, the tumour, when examined after removal, has appeared to be of a whitish colour, resembling on a general and distant inspection, the appearance of the brain, and having a pulpy consistence. Mr. Abernethy has also often seen it of a brownish red appearance. The following case is related, to illustrate the nature and progress of the disease.

"A tall, thin, healthy-looking man, of about forty years of age, had, about fifteen years before, a swelled testicle from a gonorrhœa; the epididymis remained indurated. Six years afterwards it became enlarged, and a hydrocele at the same time formed. Half a pint of water was discharged by a puncture, but inflammation succeeded the operation, and this testis became very large. An abscess formed, and burst in the front of the scrotum, and the testis subsided in some degree. Mercury was employed to reduce it, but without effect. The part, however, was indolent, and gave the patient no trouble but from its bulk.

"About a year afterwards, a gland enlarged in the left groin (the same side as the testis): another then became swoln in the right groin, and, in the course of two years, several glands in each groin had obtained a very considerable magnitude. At this period, he was admitted into St. Bartholomew's Hospital, under the care of Mr. Long. The testis was, at this time, between four or five inches in length, and about three in breadth; it resembled its natural form, and was indolent in its disposition. The spermatic chord was thickened, but not much indurated. Four or five glands were enlarged in the groin on both sides; each of which was of the size of a very large orange; and when observed together, they formed a tumour of very uncommon shape and magnitude.

"They gradually increased in size for several months, till at last the skin appeared as if unable to contain them any longer. It became thin, inflamed, and ulcerated, first in the left groin, and thus exposed one of the most prominent tumours. The exposed tumour inflamed and sloughed progressively, till it entirely came away. As the sloughing exposed its vessels, which were large, they bled profusely, insomuch that the students endeavoured, but in vain, to secure them by ligatures: for the substance of the tumour was cut through, and torn away in the attempt. Pressure by the finger, continued for some time, was the only effectual mode of restraining this hemorrhage.

"The loss of one gland relieved the distended skin, which had only ulcerated on the most prominent part of the tumour, and had not become diseased. It now lost its inflamed aspect: granulations formed, and a cicatrix took place. In the opposite groin a similar occurrence happened. One gland, exposed by the ulceration of the skin, sloughed out, being attended by the circumstances just recited. However, before the skin was cicatrized, ulceration had again taken place in the right groin, in consequence of the great distention of the skin from the growth of the tumour; and sloughing had begun in the tumour, when the patient, whose vital powers had long been greatly exhausted, died." (See *Surgical Observations, &c.* 1804, *by J. Abernethy, F. R. S. &c.*)

The preceding kind of disease bears a considerable resemblance to fungus hæmatodes; but differs in the parts sloughing out, and then healing, instead of a fungus shooting out, and continually increasing in size. (See *Fungus Hæmatodes.*)

Dr. Baillie has noticed some affections, in which the testicle becomes bony, cartilaginous, &c.; but, on these it is not necessary for us to dwell in this dictionary. The preceding observations may be considered as relating expressly to the diseases for which castration is generally performed. See *Castration.*

Besides the fungus, which arises from the testicle in the advanced stage of carcinoma, and the bleeding fungous growth, which arises from this organ in the ulcerated state of fungus hæmatodes, there is another superficial fungous excrescence, to which the testicle is subject, and which is entirely free from all malignancy. The disease, to which I refer, has been noticed by Callisen, under the name of *lipoma of the testicle.* "Si ex superficie albugineæ vel ipsa tunica vaginali excrescentiæ surgunt, totum demum testem involventes, et scirrhum seu fungum, mentientes, ipsius tamen testis substantia parum aut vix de statu naturali aberrante; malum naturam lipomatis sequitur, vix unquam in scirrhum et carcinoma abiens." (See *Systema Chirurgiæ Hodiernæ, Vol.* 2, *p.* 145, *Edit.* 1800.) The *superficial fungus*, or *lipoma of the testicle*, was noticed in an early edition of another publication, and described as "a particular affection of the testicle, in which a fungus grows from the glandular substance of this body, and, in some instances, from the surface of the tunica albuginea. This excrescence is usually preceded by an enlargement of the testicle, in consequence of a bruise, or some species of external violence. A small abscess takes place, and bursts, and from the ulcerated opening the fungus gradually protrudes." I then proceeded to represent how unnecessary and improper it was to extirpate the testicle, on account of this affection, if, after the subsidence of the inflammation, the part should not seem much enlarged and indurated. I recommended the fungus to be cut off, or else destroyed with caustic; and I founded my advice on a successful attempt of the first kind, which was made in St. Bartholomew's Hospital, by Sir James Earle, a little while before my book was published. (See *First Lines of the Practice of Surgery, p.* 399.)

An interesting little paper has also been written on the subject, by my friend Mr. Lawrence, who has favoured the public with a more particular account, and nine cases illustrative of the causes, symptoms, and progress of the disorder. According to Mr. Lawrence, the patient generally assigns some blow, or other injury, as the cause of the complaint; in other instances, it originates in consequence of the hernia humoralis from gonorrhœa, and sometimes appears spontaneously. A painful swelling of the gland, particularly characterized by its hardness, is the first appearance of the disease. After a certain length of time, the scrotum, growing gradually thinner, ulcerates; but, the opening, which is thus formed, instead of discharging matter, gives issue to a firm, and generally insensible fungus. The surrounding integuments and cellular substance are thickened and indurated by the complaint, so that there appears to be altogether a considerable mass of disease. The pain abates, and the swelling subsides considerably, when the scrotum has given way. In this state, the disorder appears very indolent; but if the fungus be destroyed by any means, the integuments come together, and a cicatrix ensues, which is inseparably connected with the testicle. Mr. Lawrence next informs us, that if the part be examined while the fungus still remains, the excrescence is found to have its origin in the glandular substance of the testicle itself; that the coats of the part are destroyed to a certain extent; and that a protrusion of the tubuli seminiferi takes place through the aperture thus formed. Mr. Lawrence says, he has often ascertained the continuity of the excrescences with the pulpy substance of the testicle, of which more or less remains, according to the difference in the period of the disorder. The same gentleman thinks, that the glandular part of the testicle experiences an inflammatory affection in the first instance, in consequence of the violence inflicted on it; and that the confinement of the swollen substance, by the dense and unyielding tunica albuginea, sufficiently explains the peculiar hardness of the tumour, and the pain which is always attendant on this stage of the disorder. The absorption of the coats of the testis, and of the scrotum, obviates the tension of the parts, and thereby restores ease to the patient, at the same time that the fungus makes its appearance externally.

With regard to the treatment, Mr. Lawrence is of opinion, that, if the complaint were entirely left to itself, the swelling would probably subside, the fungus shrink, and a complete cure ensue, without any professional assistance; but, he adds, that the disorder is so indolent in this stage that a spontaneous cure would not be accomplished till after much time. He says, that the excrescence may be removed with a knife, or, if the nature of its attachment permit, with a ligature, or that it may be destroyed with escharotic applications. Mr. Lawrence very judiciously gives the preference to removing the tumour to a level with the scrotum, by means of the knife, as the most expeditious and effectual mode of treatment. He can discern no ground whatever for proposing castration in this malady, since, in no part of its progress, nor in any of its possible consequences and effects, can it expose the patient to the slightest risk.

Mr. Lawrence also mentions the possibility of there being other kinds of funguses, which may be met with, growing from the testicle, and quotes an instance, in which Dr. Macartney found a fungus, of a firm and dense structure, growing from the tunica albuginea, while all the substance of the testicle itself was sound. Dr. Macartney was so kind as to shew me the preparation, affording a clear specimen of the second kind of fungus. The cases drawn up by Mr. Lawrence are, in my opinion, highly interesting, and may be read in the *Edinb. Med. and Surgical Journal for July*, 1808.

We have seen, that Callisen represents the lipoma, as sometimes originating from the surface of the tunica vaginalis, a kind of case, which has not yet fallen under my observation.

TETANUS. (from τεινω, to stretch.) Tetanus is defined by all authors to be a more or less violent, and extensive, contraction of the muscles of voluntary motion, attended with tension and rigidity of the parts affected.

The excessive contraction of the muscles is kept up, without any intervals of complete relaxation, in which respect the disorder differs from ordinary spasms and convulsions, where the contractions and relaxations alternate in rapid succession. In tetanus, the powers of sensation and intellect also remain unimpaired, in which particularity it forms a contrast to epilepsy. (*Rees's Cyclopedia, Art. Tetanus.*)

When its effects are confined to the muscles of the jaw or throat, it is called *trismus*, or *locked-jaw;* when all the body is affected and becomes rigid, but retains its ordinary straightness, the case is named *tetanus.* When the body is bent forwards, the disease is termed *emprosthotonos*; and *opisthotonos*, when the muscles of the back are principally affected.

To these four forms, some writers have added a fifth, which they denominate *pleurosthotonos*, and which is characterized by the body being drawn to one side. It is the *tetanus lateralis* of Sauvages.

The different terms, which are applied to tetanic affections, do not imply so many particular diseases; but, only the seat and various degrees of one and the same complaint.

A far more important division of tetanus, is into the *acute* and *chronic*, according to its greater or lesser intensity. The first is exceedingly dangerous, and usually fatal; while the latter, on account of the more gradual progress of the symptoms, affords more opportunity of being successfully treated. (*Larrey, in Mém. de Chirurgie Militaire, Tom.* 1, *p.* 235, 236.)

Tetanus may also be distinguished into the *traumatic*, or that arising from wounds, being the case with which surgeons have principally to deal; and into the *idiopathic*, or that proceeding from a variety of other causes.

*Traumatic* tetanus sometimes comes on in surprisingly sudden manner, and quickly attains its most violent degree. The most rapidly fatal case, that has ever been recorded, is one, that we have on the authority of the late Professor Robison of Edinburg. It occurred in a negro, who scratched his thumb with a broken china plate, and died of tetanus a quarter of an hour after this slight injury. (See *Rees's Cyclopœdia, art. Tetanus.*) But, commonly, the approaches of the disorder are more gradual, and it slowly advances to its worst stage. In this sort of case, the commencement of the disorder is announced by a sensation of stiffness about the neck, a symptom, which increasing by degrees, renders the motion of the head difficult and painful. In proportion as the rigidity of the neck becomes greater, the patient experiences about the root of the tongue, an uneasiness, which soon changes into a difficulty of mastication and swallowing, which after a time become totally impossible. The attempt at deglutition is attended with convulsive efforts, especially when an endeavour is made to swallow liquids; and so great is the distress, which accompanies these convulsions, that the patient becomes very reluctant to renew the trials, and refuses all nourishment. Sometimes it even inspires him with a dread of the sight of water, and a great resemblance to hydrophobia is produced.

One of the next remarkable symptoms is a very severe pain at the bottom of the sternum, darting from this point backward to the spine, in the direction of the diaphragm. As soon as this pain commences, the spasms of all the muscles about the neck become exceedingly violent, and the head is drawn backwards, or forwards, according as the contraction of the extensor, or flexor muscles, happens to be strongest; but, in the majority of cases, the head and trunk are curved backwards, (*Boyer Traité des Mal. Chir. Tom.* 1, *p.* 288.) and the contractions increasing in force, the body is frequently raised in the form of a bow, resting upon the head and feet alone; a state, which is more particularly denominated *opisthotonos*. (*Rees's Cyclopædia, art. Tetanus.*) At the same time, the muscles, which close the lower jaw, and which were affected with spasm and rigidity in the very beginning of the disorder, now contract with great power, so as to maintain the lower jaw-bone inseparably applied to the upper one. This last state, which has been considered as a particular affection under the name of *trismus*, or the *locked-jaw*, Boyer conceives, may be regarded as the pathognomonic symptom of tetanus, which in many instances is limited to such an affection of the jaw.

The muscles affected in tetanic cases are never altogether relaxed, as long as the disease continues; but, still they become more violently contracted in the frequent paroxysms of spasm, which always attend the complaint, and increase as it advances.

The continuance of the disease is marked by the increasing spasm of the diaphragm, which now returns every ten or fifteen minutes, and is instantly succeeded by a stronger retraction of the head and rigidity of the muscles of the back, and even of those of the lower extremities. The abdominal muscles are also strongly contracted, so that the belly feels as hard and tense as a board. By the violence of the contractions, indeed, the recti muscles have been known to be lacerated, as we shall relate an example of hereafter. Sometimes the spasm and tension extend only to the muscles on one particular side of the body: the *tetanus lateralis* of Sauvages, and the *pleurosthotonos* of other nosologists.

When the disease reaches its most violent stage, the flexor muscles of the head and trunk contract so powerfully, that they counterbalance the force of the extensors, and hold those parts in a straight, fixed, immoveable position. This is the condition, to which the appellation of *tetanus*, more particularly belongs. The muscles of the lower extremities become rigid; and even the arms, which till now were little affected, also partake of the general spasm and stiffness, with the exception of the fingers, which often retain their moveableness to the last. The tongue likewise continues a long while endued with the power of voluntary motion; but, at length, the violent spasms do not leave it unaffected, and it is then liable to be forcibly propelled between the teeth, where it is sometimes dreadfully lacerated.

In the extreme period of the disorder, all the muscles destined for voluntary motion are affected; amongst others, those of the face; the forehead is drawn up into furrows; the eyes, sometimes distorted, are generally fixed and motionless in their sockets; the nose is drawn up; and the cheeks are retracted towards the ears; so that the features undergo a most extraordinary change. When tetanus arrives at this stage, and the spasms are universal, a violent convulsion usually puts an end to the patient's misery.

Wherever the muscular contractions are situated in cases of tetanus, they are always accompanied with the most excruciating pain. They sometimes last, without any manifest remission, to the end of the disorder; but, in almost all cases, their violence, and the sufferings excited by them, undergo periodical diminutions every minute, or two. The relaxation, however, is never such as to let the muscles, which experience it, yield to the action of their antagonists; and it is in nearly all cases followed, in ten or twelve minutes, by a renewal of the previous contractions and suffering. The recurrence of these aggravated spasms frequently happens, without any evident cause; but, it is often determined by efforts, which the patient makes to change his posture, swallow, speak, &c.

As Dr. Cullen observes, the attacks of this disease are seldom attended with any fever. When the spasms are general and violent, the pulse is contracted, hurried, and irregular; and the respiration is affected in like manner; but, during the remission, both the pulse and respiration usually return to their natural state. The heat of the body is commonly not increased; frequently the face is pale, with a cold sweat upon it; and, very often, the extremities are cold, with a cold sweat over the whole body. When, however, the spasms are frequent and violent, the pulse is sometimes more full and frequent, than natural; the face is flushed, and a warm sweat is forced out over the whole body.

"Although fever be not a constant attendant of this disease, especially when arising from a lesion of nerves; yet, in those cases, proceeding from cold, a fever sometimes has supervened, and is said to have been attended with inflammatory symptoms. Blood has often been drawn in this disease; but, it never exhibits any inflammatory crust; and all accounts seem to agree, that the blood drawn seems to be of a looser texture than ordinary, and that it does not coagulate in the usual manner.

"In this disease the head is seldom affected with delirium, or even confusion of thought, till the last stage of it; when by the repeated shocks of a violent distemper, every function of the system is greatly disordered.

"It is no less extraordinary, that in this violent disease, the natural functions are not either immediately, or considerably affected. Vomitings sometimes appear early in the disease; but commonly they are not continued; and it is usual enough for the appetite of hunger to remain through the whole course of the disease; and what food happens to be taken down, seems to be regularly enough digested. The excretions are sometimes affected, but not always. The urine is sometimes suppressed, or is voided with difficulty and pain. The belly is costive; but, as we have hardly any accounts, excepting of those cases, in which opiates have been largely employed, it is uncertain, whether the costiveness has been the effect of the opiates or of the disease. In several instances of this disease, a miliary eruption has appeared upon the skin, but whether this be a symptom of the disease, or the effect of a certain treatment of it, is undetermined. In the mean while, it has not been observed to denote either safety or danger, or to have any effect in changing the course of the distemper."—(*First Lines of the Practice of Physic, vol.* 3.)

According to M. Larrey, the opisthotonos is not so often observed in Egypt as the emprosthotonos, and the experience of this gentleman taught him, that the former was the most rapidly fatal. We must not adopt, however, his curious opinion, that the violent extension of the vertebræ of the neck, and the manner, in which the head is thrown back, cause strong compression of the spinal marrow, and a permanent contraction of the larynx and pharynx, (*Mém. de Chirurgie Militaire, Tom.* 1, *p.* 240.) since this sort of compression, if it did not at once destroy the patient, would at any rate paralize most of the muscles, and instantly stop their extraordinary contraction.

This experienced writer notices how much the nerves of the neck and throat seem generally to be affected on the invasion of this disease. The consequent contraction of the muscles of these parts, he says, is soon attended with difficulty of deglutition and respiration. The patients then experience, if not a dread of liquids, at least a great aversion to them, which often prevents the administration of internal remedies; and if the wound is out of reach of the interference of art, the patient is doomed to undergo the train of sufferings attendant on this cruel and terrible disorder. Nothing can surmount the obstacles, which present themselves in the œsophagus. The introduction of an elastic gum catheter into this canal, through the nostrils, is followed by convulsions and suffocation. "I have tried this means (says Larrey) on the person of M. Navailh, a surgeon of the second class, who died of a locked-jaw, brought on by a wound of the face, accompanied with a comminuted fracture of the bones of the nose, and part of the left orbit.

"In the examination of the bodies of persons dead of tetanus, I have found the pharynx and œsophagus much contracted, and their internal membrane red, inflamed, and covered with a viscid reddish mucus.

"Hydrophobia, hysteria, and several other nervous diseases, likewise produce their chief effects upon these organs, and the result appears to be the same. So, I have just remarked, when tetanus is arrived at its worst degree, the patients have a great aversion to liquids, and, if they are forced to swallow them, immediate convulsions are excited. This circumstance was particularly observed in M. Navailh."—(*Mém. de Chirurgie Militaire, Tom.* 1. *p.* 247, 248.)

Sometimes tetanic affections deviate from their ordinary course and nature. The most singular of these anomalies is recorded by Sir Gilbert Blane; it is a case, in which tetanus prevailed to a very considerable extent, without any degree of pain. The spasms were accompanied with a tingling sensation, which was even rather agreeable than distressing. The case, however, terminated fatally; but, to the last, no pain was experienced. In two examples, mentioned by the same author, the spasms affected only the side of the body, in which the wound was situated.

The dissection of patients, who have died of tetanus, has thrown no light upon the nature of this fatal disorder. Sometimes, slight effusions are found within the cranium; but, in general, no morbid appearance whatever can be detected in the head. There is always more or less of an inflammatory appearance in the œsophagus and in the villous coat of the stomach about the cardia. But those, who are conversant with dissections, must be well aware, that these appearances are common to a great number of diseases, and are uniformly met with in every case of rapid, or violent death. Besides the redness and increased vascularity of these parts, M. Larrey, as we have already stated, found the pharynx and œsophagus much contracted, and covered with a viscid reddish mucus. He also found numerous lumbrici in the bowels of several patients who died.—(See *Mém. de Chir. Militaire, Tom.*3. *p.* 287.) This, however, could only be an accidental complication, and not a cause. In several cases, Dr. M'Arthur found the intestines much inflamed, and in two of them a yellow, waxy fluid, of a peculiar offensive smell, covered their internal surface; but, whether the inflammation was primary, or only a consequence of the pressure of the abdominal muscles, which contract so violently in this disease, he is unable to decide.—(See *Medico-Chirurgical Trans. Vol.* 7, *p.* 475, *and Rees's Cyclopædia, art. Tetanus.*)

Dr. Lionel Chalmers, of Charles Town, South Carolina, states, that when the disease forms very quickly, and invades the unfortunate person with the whole train of its mischievous symptoms, in a few hours, the danger is proportioned to the rapidity of the attack, and that the patients thus seized, generally die in 24, 36, or 48 hours, and very rarely survive the third day. But, when the disease is less acute, few are lost after the ninth, or eleventh. (See *Med. Obs. and Inq. vol.* 1. *p.* 92, 93.)

From the valuable report of Sir James Macgrigor, it appears, that several hundreds of cases of tetanus occurred in our army, during the late campaigns in Spain and Portugal. The disease was observed to come on at uncertain periods after the receipt of the local injury; but, it terminated on the second, third, and fourth days, and even as late as the seventeenth and twentieth day; though it was usually not protracted beyond the eighth.—(*Medico-Chir. Trans. Vol.* 6, *p.* 453.)—I had a patient, however, who lingered in the military hospital at Oudenbosch five weeks, with chronic tetanus, before he died. This happened in the year 1814, soon after the assault on Bergen-op-Zoom, where the patient had been wounded, and suffered amputation of the thigh.

Although tetanus is a disease, which has been observed, in almost all parts of the world, experience proves, that its frequency is much the greatest in warm climates, and especially in the hot seasons of those climates. It is also more common in marshy situations, and countries bordering upon the sea, than in places which are very dry, elevated, and at a distance from the sea-coast. Every class of individuals is exposed to its attacks; but, infants a few days after their birth, and middle-aged persons, are said to be oftener affected, than older subjects, or others in the youthful period of life. The male sex more frequently suffer, than the female; and the robust and vigorous more frequently, than the weaker.

According to Dr. Cullen and other medical writers, the causes of tetanus, are cold and moisture, applied to the body, while it is very warm, and especially the sudden vicissitudes of heat and cold. Or the disease is produced by punctures, lacerations, or other injuries. Cullen admits, however, that there are probably some other causes, which are not distinctly known.

M. Larrey observed, that gunshot wounds in the course of the nerves, and such injuries of the joints, often produce tetanus in the climate of Egypt, particularly when the weather, or temperature, passed from one extreme to the other, in damp situations, and in those which were adjacent to the Nile, or the sea. What he terms dry and irritable temperaments, were the most subject to the disorder, the event of which was found to be almost always fatal. (*Larrey, Op. et Loc. cit.*)

Traumatic tetanus is remarked to proceed oftener from wounds of the extremities, than from similar injuries of the trunk, head and neck. Sometimes, it originates at the moment of the accident, as in the instance mentioned by the late Professor Robison of Edinburgh; but, in general, it does not come on till several days afterwards, sometimes not till the wound is nearly, or perfectly healed, and free from all pain and uneasiness. Wounds of every description may give rise to tetanus, and in warm climates, very trivial injuries produce it. Thus, in Egypt, M. Larrey had one case, which proceeded from the lodgment of a small piece of fish bone in one of the sinuses of the fauces. (*Mém. de Chirurgie Militaire, Tom.* 1, *p.* 254.) There can be no doubt, however, that in colder regions, traumatic tetanus seldom happens except from contused, punctured, or lacerated wounds; or wounds of the ginglimoid joints, with laceration of the tendons and ligaments; compound fractures, or dislocations; deep pricks in the sole of the foot; and especially lacerations of the fingers and toes. A partial division of a nerve has been suspected as a cause; but, as some nerves must be imperfectly cut through in almost every wound, and yet tetanus does not arise, the reality of this cause is doubtful. Besides, if it were true, the cure would be easily effected by making the division of the nerve complete, which experience contradicts. Baron Larrey, however, has recorded a fact, which favors the opinion, as I shall presently notice. The inclusion of the nerves in the ligatures applied to arteries is another alleged cause of tetanus; but, as this fault is very common, and tetanus rather rare in this country, while it may follow all sorts of wounds, whether accidents, or operations, the accuracy of this opinion may also be doubted. In support of it, however, there are some cases and observations adduced by Larrey, which will be quoted in the sequel of this article. (See *Tom.* 3, of his *Mem. de Chir. Mil.*) I do not mean to hint, however, that the nerves are not sometimes tied in tetanic cases, or that the practice is not on every account blameable. Amputation and castration are the only great surgical operations to which I have seen tetanus succeed; though it may follow the employment of the knife on less severe occasions.

In warm countries, tetanus is an ordinary consequence of all kinds of wounds.

There cannot be a doubt, that difference of climate makes considerable difference in the degree and danger of tetanus. M. Larrey found, that, in Egypt, the disease was more intense, and bore a greater resemblance to hydrophobia, than in the colder climate of Germany. In both these countries, he remarked, that when the wounds, causing tetanus, injured nerves situated on the forepart of the body, emprosthotonos was occasioned; that if the posterior nerves were hurt, opisthotonos followed; and that when the wound extended quite through a limb, so as to injure equally both descriptions of nerves, complete tetanus ensued. He noticed, also, that the disease commonly only arose from wounds, when the seasons and temperature passed from one extreme to another. Exposure to the cold damp nocturnal air, he found particularly conducive to it. (See *Mém. de Chirurgie Militaire, Tom.* 3, *p.* 286.)

In the late campaigns of our armies in Spain and Portugal, according to the report of Sir James Macgrigor, tetanus occurred in every description, and in every stage of wounds, from the slightest to the most formidable: it followed the healthy and the sloughing; the incised and the lacerated; the most simple and the most complicated. It occurred at uncertain periods; but, it was remarked, that, if it did not commence before 22 days, from the date of the wound, the patient was safe. (See *Medico-Chirurgical Trans. Vol.* 6, *p.* 453.) In Egypt, as we learn from M. Larrey, the latest period of the commencement of tetanus after a wound, was from the fifth to the fifteenth day. (*Mém. de Chir. Militaire, T.* 1, *p.* 263.)

It is observed by Dr. Dickson, that as the acute form of tetanus is so uniformly fatal, it is of the greatest consequence to attend to whatever may assist in detecting the disease early, or in warding it off. Richerand states, that, in wounds threatening convulsions and tetanus, a persevering extension of the limbs during sleep often manifests itself, before any affection of the lower jaw; and we should naturally pay more attention to any admonition of this kind in punctured, or extensive lacerated wounds, particularly of tendinous, or ligamentous parts, and especially in injuries of the feet, hands, knee-joint, back, &c. Some prelusive indications of danger may often be derived from the increase of pain, irritation, restlessness, nervous twitchings, pain and difficulty in deglutition, or in turning the head; spasms, or partial rigidity of some of the voluntary muscles; pain at the scrobiculus cordis; a suppressed, or vitiated state of the discharge, &c. which mark the slower approaches of the disease. M. Larrey adduces several instances of tetanus, in which the wound was either dry, or afforded only a scanty serous exudation, and where the symptoms were relieved on suppuration being re-established; and Dr. Reid, in the Edinburgh Medical and Surgical Journal for July 1815, remarks, that, on removing the dressing, the wound was covered with a darkish unhealthy-looking matter, and that he had seen this change the forerunner of tetanus in two other instances. A torpor of the intestines has generally been observed to precede, as well as accompany the disease, and Boyer, in particular, enumerates an obstinate constipation amongst the predisposing causes. (*Traité des Mal. Chir. T.* 1. *p.* 287.) Mr. Abernethy also informs us, that in four cases, where he inquired into the state of the bowels, the evacuations were not like feces; and he proposes as a question, in investigating the cause, what is the state of the bowels, between the infliction of the injury, and the appearance of this dreadful malady? (*Abernethy's Surgical Works, Vol.* 1, *p,* 104.) Dr. Parry thinks the velocity of the circulation an useful criterion of the danger of the disease, and observes, that, if the pulse be not above 100 or 110, by the fourth, or fifth day, the patient almost always recovers; but that if it be quickened early, the disease mostly proves fatal, and yet there are a few instances of recovery, where the pulse has risen to 120 on the first day. M. Larrey remarks, that, when the perspiration, which so often attends the disease, is symptomatic, it begins upon the head and extremities; but, that when it is critical it occurs over the chest and abdomen. (*Mémoires de Chir. Militaire, Tom.* 1. *p.* 256.) It must be confessed, however, that, in many cases, perspiration flows very freely, without bringing relief. (*Rees's Cyclopædia, art. Tetanus.*)

I next proceed to consider the treatment of tetanus, a subject of infinite difficulty, because the disease frequently baffles every mode of practice, and in certain instances gets well under the employment of the very same remedies, which decidedly fail in other similar cases of the disorder. Every plan has occasionally succeeded, and every plan has still more frequently miscarried. The great difficulty, therefore, is to ascertain, amongst numerous discordant accounts, what practice is found on the whole to be attended with the least ill-success? For, in the present state of our knowledge, the most credulous practitioner will not flatter himself with the supposition, that any effectual remedy for tetanus has yet been discovered. As, however, tetanus was regarded by Hippocrates and the ancients as certainly mortal, and it does not always prove so in modern times, it seems allowable to conclude that the recoveries, which now happen, must be ascribed to improvements in practice. This reflection should lead us not to give up the subject as hopeless; but to redouble our exertions for the discovery of a more successful method of treatment, and, if possible, of some new medicine, possessing more specific power over the disorder.

As it is justly observed by a well-informed writer, when we reflect upon the obscurity, which involves both the *ratio symptomatum,* and the proximate cause of tetanic affections, we need not wonder, that the practice in these disorders should still be entirely empirical. The indication of cure, which is generally applicable in all diseases, namely, the removal of the exciting causes, has but little place in a morbid condition, which is the consequence of causes, that in general have ceased to act, or which it is not in our power either to remove or control. In those cases, where we could suppose local irritation to be still operating, the most effectual method of counteracting its effects on the system, would obviously be to intercept all communication between the seat of the irritation and the sensorium. If, however, the disease has already established itself, and the severe symptoms have come on, it does not appear, that this would succeed in arresting the course of the disorder. Experience has but too fully shewn, that the amputation of the limb, from the injury of which the tetanus has arisen, will very seldom procure even a mitigation of the symptoms, if performed after a certain period from their first appearance. (*Rees's Cyclopædia, art. Tetanus.*) Baron Larrey has been the greatest modern advocate for the performance of amputation in cases where tetanus depends upon a wound of the extremities; but, the facts which he has adduced in its favour are not numerous, and *he limits his recommendation of the measure chiefly to chronic cases,* and extends it to no others, except on the very first accession of the symptoms.

"The equally unexpected and entire success (observes M. Larrey), obtained, by the amputation of the injured limb, in the person of an officer attacked with *chronic* tetanus, leads me to propose the question, *whether, in this disorder, occasioned by a wound of some part of the extremities, it would not be better to amputate the injured limb immediately the symptoms of tetanus commence, rather than expect from the resources of nature, and from very uncertain remedies, a cure, which so seldom happens?*

"If tetanus is chronic, as is sometimes observed, amputation may be done at every period of the disorder, provided a choice be made of the time, when there is an intermission of the symptoms. The operation would not answer so well in acute tetanus, if the disease were advanced, and the muscles to be divided were strongly contracted and rigid, as I have observed at the siege of Acre in a soldier, who was seized with tetanus, in consequence of a gun-shot wound of the left elbow." (*Mém. de Chir. Militaire, Tom.* 1, *p.* 262.)

Larrey did, indeed, try amputation in a few instances of acute tetanus. In the case last cited, the symptoms were already considerably advanced, when the experiment of amputating the arm was made; yet, says Larrey, the operation was followed by considerable ease. The symptoms recurred, howevever, a few hours afterwards, and proved fatal on the third day. In another example, this gentleman repeated the experiment, though acute tetanus had begun. The operation is described as having stopped all the symptoms, as it were, by enchantment; the patient even passed twelve hours in perfect ease; but, being exposed to the damp cold air, the disorder returned, and carried him off. (See *Mém. de Chirurgie Militaire, Tom.* 1, *p.* 263—269.) The Baron also records some cases in favour of amputation at the commencement of tetanus from wounds, and especially for the relief of the disease in its chronic form. He has likewise adduced an interesting example, in which speedy relief and a cure followed cutting off all communication between the nerves of the wounded part and the sensorium by a suitable incision.

In this place, I think it right to remind the reader, that although Baron Larrey once or twice amputated when acute tetanus was somewhat advanced, he does not advise the practice, and he expressly restricts his sanction of amputation to chronic or quite incipient cases of tetanus, and to a few instances, in which the ginglimoid joints are fractured, accidents, which independently of tetanus would generally require the operation. (See *Mém. de Chir. Mil. Tom.* 3.) The report of Sir James Macgrigor fully confirms the statement of M. Larrey; namely, that free incisions are of little avail in the acute and fully formed disease, and that amputation fails in the same kind of case. After the battle of Toulouse this operation was extensively tried; but, without success. The French are also said to have lost an immense number of soldiers from tetanus after the battle of Dresden, when Sir James infers that the practice of amputation must have been fairly tried. (See *Medico-Chirurgical Trans. Vol.* 6, *p.* 456.) We have seen, however, that, according to the precepts of M. Larrey, the French surgeons would only have performed the operation in chronic cases, which are not the most frequent, or if in other instances, only on the very first accession of the symptoms. But, upon the whole, notwithstanding the partial degree of success attending M. Larrey's experiments, I have no hesitation in declaring my belief, that amputation of the injured part in cases of chronic tetanus will never be extensively adopted. The uncertain efficacy of this severe measure, and the occasional possibility of curing this form of the complaint by milder plans, will for ever constitute insuperable arguments against the practice.

On the subject of making incisions for the purpose of separating the nerves of the wounded part from the sensorium, Larrey states, that they should be practised before inflammation has come on; for, if this has made progress, they would be useless and even dangerous. They should comprehend, as much as possible, all the nervous filaments and membranous parts; but, he condemns all incisions into joints, as exasperating the symptoms of tetanus, instances of which he has witnessed. The Baron has recorded some convincing proofs of the benefit sometimes arising from completely dividing the trunk of the injured nerve. In one instance, tetanic symptoms followed an injury of the supraorbitary nerve, but were immediately stopped by dividing some of the fibres of the occipito-frontalis, and the nerves and vessels, down to the bone.

On the principle of destroying the parts, which are the seat of the local irritation, Baron Larrey also frequently applied the actual and potential cautery to the wound. The application of caustics, says he, may be practised with advantage on the first attack of the symptoms, the same precept being observed as in making the incisions. Bleeding, if necessary, and the use of topical emollients and anodynes, may follow these operations; though in general they have little effect. (*Mém. de Chir. Militaire, Tom.* 1, *p.* 249.) In the third volume of this interesting work, p. 297, &c. are several cases, in which the cautery was employed with success. We must not conclude, however, that much dependence ought to be placed in the use of the cautery, since M. Larrey observes in another place: " The moxa and actual cautery, recommended by the Father of Medicine, have been equally unavailing. The moxa was employed at Jaffa upon three wounded men; the disease notwithstanding followed its usual course, and terminated fatally.

" I have cited a striking instance of the inefficacy of the second method, in a case of opisthotonos." (*Tom.* 1, *p.* 258.) This author also adduces some cases, which tend to support the opinion, that tetanus occasionally proceeds from the inclusion of a large nerve in the ligature applied to an artery. The son of General Darmagnac died of tetanus consequent to amputation, and upon examining the stump, the median nerve was found included in the ligature with the artery, and its extremity reddish and swollen. (*Mém. de Chir. Mil. T.* 3, *p.* 287.) In another case, Larrey suspected the tetanic disorder to proceed from a principal branch of the crural nerve being tied together with the femoral artery, and he cut the ligature; but, the relief was only partial and temporary. The cautery was therefore applied deeply to the whole surface of the stump. A marked amendment took place a few hours afterwards, and the patient recovered. A diaphoretic mixture, with camphor and opium, was also exhibited. (*T.* 3, *p.* 297.)

Amongst other local means for the relief of tetanus, we might as well notice the employment of blisters as near as possible to the wound, or their application, or that of the ointment of cantharides, to the wound itself. Almost all modern writers have observed, that tetanus is accompanied at its commencement and in its progress with an interruption, or total cessation of suppuration in the wound. Hence, the indication to excite this process again by the means, which I have specified. Larrey seems to have adopted both plans; but, he particularly applied the ointment of cantharides to the wound itself in an early stage of the symptoms, and in cases where there not only was a suppression of the discharge, but where he suspected the nerves of the wounded part had suffered from exposure to the cold damp air, on the detachment of the sloughs. For facts, in favour of these local means, the reader must refer to the first and second volumes of the Mémoires de Chirurgie Militaire.

It appears also from M. Larrey's experience in Egypt, that poultices, made of the leaves of tobacco, and applied to the wounds of persons labouring under tetanus, are followed by no advantageous effect. The alkalies also proved of no service. (*Tom.* 1, *p.* 257.)

I shall conclude these remarks on, what may be called, the local treatment of tetanus with mentioning, that the celebrated Dr. Rush recommended the wound to be dilated and dressed with oil of turpentine. (See *Trans. of the American Philos. Society, Vol.* 2); and that our naval surgeons often use tincture of opium as a dressing.

A great degree of obscurity prevails, respecting the most eligible *general* or *constitutional* plans of treating tetanus, and, I am afraid, it must be confessed, that our internal remedies cannot be more depended upon, than the local means, already described. This opinion is fully confirmed by adverting to the discouraging fact recorded by Sir James M'Grigor, viz. that out of several hundreds of cases, which occurred in the British army during the late campaigns in Spain, and Portugal, there were very few, which terminated successfully, or, in which the remedies, however varied, seemed to have any beneficial influence, after the disease had made any progress. (*Medico-Chir. Trans. Vol.* 6, *p.* 449.) The possibility of doing much good by internal medicines is also sometimes totally prevented by the inability of swallowing which afflicts the patient. In short, the present state of our knowledge, respecting tetanus, will not allow us to indulge much hopes of cure from any means yet discovered, except in the chronic form of the complaint, the instances of success in the treatment of acute tetanus being by no means numerous.

Of all medicines, opium is that, which has raised the greatest expectation, and been the most extensively tried in cases of tetanus. Indeed, there cannot be a doubt, that in many chronic, mild cases, it is competent to effect a cure. But, for this purpose, it is absolutely necessary, that its use be begun from the earliest appearance of the symptoms; that it be given in very large doses; and that the doses be repeated at short intervals, so that the system be kept constantly under the influence of the remedy. It is indeed astonishing, how the system, when labouring under a tetanic disease, will resist the operation of this and other remedies, which in its ordinary state would have been more than sufficient to overpower and destroy it. Patients with tetanus will bear with impunity quantities of opium, which at any other time would have been certainly fatal. Instances are upon record of five, ten, and even twenty grains, being taken every two, or three hours, for many days, without any extraordinary narcotic effects being produced upon the sensorium. It is always advisable, however, to begin with comparatively moderate doses, such as forty or sixty drops of the tincture of opium, which may be repeated at intervals of three, or four hours, and increased at each repetition, until some sensible effect is produced on the spasms. It seems requisite to augment the dose rapidly, as the disease presses upon us every hour, and no time must be lost, while there is yet a chance of controlling its fury. The approaching closure of the jaw, and difficulty of deglutition, which may increase so as to render it hardly possible to introduce medicines into the stomach, are additional motives for pushing our remedies, before such obstacles arise. (*Rees's Encyclopædia, art. Tetanus.*) I once supposed, it might be possible to overcome this impediment by introducing a flexible catheter down the œsophagus from one of the nostrils; but the attempt to do this always brings on a violent paroxysm of spasms, attended with such a sense of suffocation, that it cannot be endured. The experience of my friend the late Mr. Cruttwell of Bath, and that of Baron Larrey, have fully proved, that no assistance can be derived in these circumstances from the use of any flexible tubes. (See *Mém. de Chirurgie Militaire, Tom.* 1, *p.* 247.) Sometimes, however, the obstacle to the administration of medicines, arising from the closure of the jaw, is prevented by loss of some of the incisor teeth, and, in some instances, Baron Larrey adopted the plan of extracting two of them. This would be useless, however, when deglutition is totally hindered, as happened in one instance recorded by the latter eminent surgeon. (*Op. cit. T.* 3, *p.* 301.) Glysters are the only resource, when the spasm of the fauces cannot be overcome. In this way, as much as a dram of the extract of opium has been introduced into the bowels in one dose. Opiate frictions upon the jaws, throat, and other parts of the body, have been practised. Opiate plasters have also been applied to the masseter muscles and behind the ears. This external use of opium, however, can only be regarded as a feeble, and probably useless method.

As the costiveness, always produced by tetanus, is rendered still more obstinate by opium, laxative medicines and glysters should constantly accompany its employment. The testimony of the army physicians, as we learn from the report of Sir James Macgrigor, is highly in favour of a rigid perseverance in the use of purgatives, given in adequate doses to produce daily a full effect. Dr. Forbes states, that a solution of sulphate of magnesia, in infusion of senna, was found to answer better, than any other purgative; and it was daily given in a sufficient quantity to procure a copious evacuation, which was always dark-coloured and highly offensive; and, to this practice he chiefly attributes, in one severe case, the removal of the disease. (*Medico-Chir. Trans. Vol.* 6, *p.* 452.)

A spasmodic rigidity of the muscles being the most prominent symptom of tetanus, it was natural for practitioners to try the efficacy of some other antispasmodic medicines, besides opium, and those which have been principally the subject of experiment, are castoreum, æther, the conium maculatum, musk, camphor, and latterly, the digitalis. In many cases, opium and camphor have been exhibited together. Indeed, M. Larrey asserts, that, of all the medicines, hitherto proposed by skilful practitioners, the extract of opium, combined with camphor, and the nitrate of potassa, dissolved in a small quantity of the almond emulsion, and given in doses more or less strong, produces the most favourable effects, since patients, who have an aversion to other fluids, take with pleasure this mixture, the action of which must be promoted by bleeding, if necessary, and blisters, under the circumstances, which have been specified. (See *Mém. de Chir. Militaire, T.* 1, *p.* 271.) In the same work, several cases are detailed, which were benefited by such treatment.

Although some practitioners have thought that they have seen good effects result from musk; yet the majority of practitioners, who have made trial of both this and camphor, in cases of tetanus, have found no reason to recommend these medicines. Possibly, this may be owing, in some instances, to sufficient doses not having been exhibited, or to the musk not being of a good quality. One hundred and fifty grains of musk, however, have been given in the space of twelve hours, to a young girl, thirteen years old, affected with an incipient tetanus; but, no salutary effect on the disorder was produced.

We learn also from Sir James Macgrigor, that æther, camphor, musk, and other antispasmodics, as likewise the alkalies, were tried by our military surgeons in Spain, and found unsuccessful. (*Medico-Chir. Trans. Vol.* 6, *p.* 458.)

From the same authority, we find, that digitalis in large doses was tried in several cases in the Peninsula; and that it, with several other medicines enumerated, failed in almost every case of acute tetanus, which occurred. (*P.* 454.) In one case recorded, the jaw remained fixed to the last, and the patient was never entirely free from spasms. (*P.* 458.) I am not acquainted with any cases, in which belladonna has been given; but, it is certainly a remedy, well worthy of trial.

Analogy has also led to the employment of the warm bath, as a plan, which seemed to promise great benefit, by producing a relaxation of the contracted muscles. But, notwithstanding this means has appeared, in a few instances, to occasion some little relief, particularly, when the practitioner has been content with mere fomentations, it generally fails, and, often, has even done mischief. This may perhaps be, in some measure, ascribable to the disturbance and motion, which the patient must necessarily undergo, in order to get into the bath; for, it is very well known, that every exertion on the part of the patient, is very apt to excite most violent paroxysms of spasm. The author of the article Tetanus, in the Encyclopédie Méthodique, mentions his having seen the warm bath do harm, in two or three cases, in which it was expected to do good. Though numerous writers have recommended the trial of the plan, it would be difficult to trace, in their accounts, any facts, which decidedly shew, that its adoption has ever been followed by unequivocal benefit. The warm bath was tried in Spain, and found to produce only momentary relief. (*Medico-Chir. Trans. Vol.* 6, *p.* 457.) Dr. Hillary, who practised, a long while, in the warm climate of America, where tetanus is very common, disapproves of this method of treatment. He observes, that although the use of the warm bath may appear to be very rational, and promise to be useful, he has always found it much less serviceable, than emollient and anti-spasmodic fomentations; and, he also mentions, that he has sometimes seen patients die, the very moment, when they came out of the bath, notwithstanding they had not been in it more than twenty minutes, the temperature of the water being likewise not higher than 29 or 30 of Reaumur's thermometer. (See *Hillary on the Air and Diseases of Barbadoes.*)

De Haen also relates a similar fact of a patient dying, the instant he was taken out of the warm bath.

It was, in all probability, the bad effects and inefficacy of the warm bath, which induced practitioners to try what might be effected by the cold one. The advantages of the cold bath were first explained by Dr. Cochrane in the Edinb. Medical Commentaries; and the plan has subsequently received the praises of Dr. Wright, the eminent Dr. Currie of Liverpool, and others. Of all the remedies, which have been employed in cases of tetanus, the cold bath seems to be that, which has been attended with the greatest success. Dr. Wright has published, in the *Medical Observations and Inquiries, Vol.* 6, a paper, in which may be found a narrative of the first trials of this method, which were all successful. The plan is said to be at present preferred throughout the West Indies. The way adopted consists in plunging the patient in cold water, and in that of the sea, when at hand, in preference to any other; or else in throwing from a certain height, several pailfuls of cold water over his body. After this has been done, he is to be very carefully dried with a towel, and put to bed, where he should only be lightly covered with clothes, and take twenty or thirty drops of laudanum. The symptoms usually seem to give way, in a certain degree, but, the relief, which the patient experiences, is not of long duration, and it is necessary to repeat the same measures, at the end of three, or four hours. They are to be repeated in this manner; that is to say, at such intervals, until those of freedom from the attacks of the disorder increase in length. This desirable event generally soon follows, and ends in a perfect cure. Wine and bark were sometimes conjoined with the foregoing means, and seemed to co-operate in the production of the good effects. Dr. Wright concludes the account with the following remark, sent to him with a case, by Mr. Drummond, of Jamaica—"I am of opinion, that opiates and the cold bath will answer every intention in the tetanus and such like diseases; for, whilst the opium diminishes the irritability, and gives a truce from the violent symptoms, the cold bath produces that wonderful tonic effect, so observable in this, and some other cases. Perhaps, the bark, joined with these, would render the cure more certain. May we not then have failed in many cases, by using opiates alone in large doses, or, what probably is worse, with the warm bath, instead of the cold bath? And have we not reason to suspect that the increased doses of opium, that seemed requisite, when the warm bath was used, may have proved pernicious?" (*Vol.* 6, *p.* 161.)

Our army surgeons, who were in Spain, are said to have found the cold bath worse than useless, (*Medico-Chir. Trans. Vol.* 6, *p.* 254); and here I beg to remark particularly, that the plan seems to present no hope of benefit in cases of tetanus from wounds, however strong the evidence is of its utility in other examples of the disease. This was the opinion of Dr. Cullen, and it is adopted by Callisen, who observes; "Immersio subita iterata totius corporis in aquam frigidam in tetano a causa interna mire prodest, in tetano a causa externa minorem effectum præstat." (*Systema Chirurgiæ Hodiernæ, Pars* 1. *p.* 169—170, *Edit.* 1798.) On the subject of cold effusion and bathing, there are on record two cases, which are curious. One is related by Baron Larrey. It was an instance of tetanus from a gun-shot wound. The cold bath was used. The two first trials gave the patient extreme pain, and no amendment followed. The sight of the bath the next time filled him with an invincible dread of the water, into which he refused to be put. He was covered, however, with a blanket, and immersed. The tetanic stiffness was immediately increased, and dreadful convulsions excited. It became necessary to remove him directly from the bath, and put him to bed. Deglutition was from the moment utterly impeded, and the contraction of the muscles carried to the most violent degree. A tumour, about as large as an egg, suddenly made its appearance near the linea alba, below the navel. After death, this was found to be caused by a rupture of one of the recti muscles, and a consequent extravasation of blood. (See *Mém. de Chirurgie Mil. T.* 3, *p.* 287—289). This case is decidedly in support of the truth of what Professors Cullen and Callisen have observed. The next is not so: It is mentioned by Sir James Macgrigor, that, in the march of the guards through Gallicia, one of them was attacked with tetanus, in consequence of a slight wound of the finger. As it was impossible to think of leaving the man in the wretched village, where he was taken ill, he was carried on a bullock car, in the rear of the battalion. During the first part of the day he was drenched with rain, the thermometer standing at 52°; but, after ascending one of the highest mountains in Gallicia, the patient was in a cold of 30°, and he was exposed from six in the morning till ten at night, when he was found half starved to death, but free from every symptom of tetanus. (See *Medico-Chir. Trans. Vol.* 6, *p.* 450.)

Another remedy, which is said to have frequently effected a cure in tetanus, is mercury. It has been employed in France with the greatest success, as may be seen by referring to the forty-fifth volume of the *Journal de Medecine.* This remedy, however, should be resorted to, in an early period of the disorder. Mercurial frictions are preferred, and these are to be put in practice so as to bring on a quick affection of the mouth; taking care, however, not to render the soreness and salivation too violent. Some contend, that it matters not, whether mercury be rubbed into the body, or given internally. It is generally allowed, that opium may be advantageously exhibited at the same time. This practice was first adopted in the West Indies, (see *Edinb. Physical and Literary Essays, Vol.* 3.) where it succeeded in many cases. Whatever benefit, however, may have been experienced from this plan in mild cases, it completely fails in the acute form of the disease. Mercurial frictions appeared to Baron Larrey to aggravate the symptoms, in the cases, where the plan was tried in Egypt; (*Mém. de Chir. Mil. T.* 1, *p.* 257.) and Dr. Emery, Mr. Guthrie, and other medical officers attached to our army in the Peninsula, tried inunction of the whole body, three times a day, with strong mercurial ointment, in unlimited quantity, with no degree of success. After the battle of Toulouse, a fatal case even occurred in a man strongly under the influence of mercury, which he had been previously using for the cure of the itch. (*Sir J. Macgrigor in Medico-Chir. Trans. Vol.* 6, *p.* 454.) The submuriate of mercury, combined with ipecacuanha, also proved inefficacious in acute cases; but, in chronic ones, the former medicine proves serviceable in keeping open the bowels.

Another method of treating tetanus, is that of administering the most powerful tonics and stimulants, such as wine, brandy, æther, preparations of ammonia, bark, cordials, &c. The introduction of this plan was chiefly owing to the eminent Dr. Rush, Professor of Medicine in Philadelphia, who published in the Transactions of the American Philosophical Society, vol. 2, a paper, entitled, "*Observations on the Cause and Cure of Tetanus.*" Dr. Rush considers tetanus as a disease essentially connected with debility, and he recommends for it the exhibition of the preceding class of remedies. He particularly advises the liberal use of wine and peruvian bark; and, as we have already stated, when tetanus arises from a wound, he directs the dilatation of it, and dressings with oil of turpentine. Considerable success is represented as having attended such practice. Several other instances of success are also recorded by Dr. Hossack. (*American Medical Repository, Vol.* 3.)

Nothing is a more certain proof of our not being acquainted with any very effectual method of treating a disease, than a multiplicity of remedies, which are as opposite as possible in their effects. We have seen, that the celebrated Dr. Rush conceived that tetanus was a disease connected with debility, and he has recorded examples, in which it was successfully treated by tonics and stimulants. Extraordinary however as it may appear, many practitioners are advocates for venesection, especially in the early stage of tetanus. Dr. Dickson thinks, that, in a full habit, where the wound is swelled, inflamed, and painful, venesection, with free purging, and such other means, as are calculated to allay the general and local irritation, affords the fairest chance of averting the danger. (See *Medico-Chir. Trans. Vol.* 7, *Part* 2.) M. Larrey has also published several cases, in which bleeding had a good effect. We are informed by Sir James Macgrigor, that, in our military hospitals in Spain, venesection had a fair trial. In three cases at St. Andero, detailed by Mr. Guthrie, this was the principal remedy. One patient with tetanus, from a wound of the back part of the hand, was bled nearly *ad deliquium* several times with good effect, calomel and diaphoretics being also given, and he recovered. Another patient was bled in the same manner with such amendment, that he suffered but little from spasm, and could open his mouth very well, when he was seized with diarrhœa, which, in his debilitated state, carried him off. In the third case, which was one of acute tetanus, venesection, pushed to the utmost, totally failed. (*Op. cit. Vol.* 6. *p.* 455—456.)

The powerfully relaxing effects of tobacco clysters, in cases of hernia and enteritis, have suggested a trial of them in tetanus. In one very acute case, the plan was tried by Mr. Earle; but, it only afforded a temporary alleviation of the spasms, and, as it caused severe agitation, it was discontinued. According to Sir James Macgrigor, tobacco clysters, tried in the advanced stage of the disease, seemed to have no effect. He considers, however, the tobacco fume, as deserving further trial.

A remarkable case is recorded by Dr. Phillips, in which the jaw suddenly fell upon the exhibition of an enema with oil of turpentine. (See *Medico-Chir. Trans. Vol.* 6, *p.* 65.)

According to Baron Larrey, frictions with oily liniments, as recommended by some authors, were tried by the French surgeons at Cairo; but, they produced no change in the state of the disease. We learn from the same authority, that the application of blisters to the throat also failed in checking the symptoms.

The Barbadoes tar, mentioned by Cullen, electricity, the colchicum autumnale, or meadow saffron, recommended by Dufresnoy, and several other means formerly in repute for their virtues in cases of tetanus, have now been fully proved by experience to possess little or no claim to this character.

Consult *Hippocrates de Morbis Popularibus, lib.* 5 *et* 7. *Aretæi et Galeni Opera. Cœlius Aurelianus de Morbis acutis. Medical Observations and Inquiries, Vol.* 1, *p.* 1 *and* 87; *Vol.* 6, *p.* 143. *Hillary on the Air and Diseases of Barbadoes. Edinburgh Physical and Literary Essays, Vol.* 3. *Dr. Carter in Medical Transactions. Dr. Cochrane in Edinburgh Medical Commentaries. Cullen's First Lines of the Practice of Physic, Vol.* 3. *Rush's Observations on the Cause and Cure of Tetanus, in Vol.* 2 *of the Transactions of the American Philosophical Soceity. Blane's Observations on the Diseases of Seamen, Edit.* 3. *Larrey's Mémoires de Chirurgie Militaire, Tom.* 1, *p.* 235, *&c. and Tom.* 3, *p.* 286, *&c. Callisen Systema Chirurgiæ Hodiernæ, Pars* 1, *p.* 165, *&c. Sir James Macgrigor, in Medico-Chirurgical Trans. Vol.* 6, *p.* 449, *&c. Dr. Phillips' Case in the same work and volume, p.* 65. *Dr. Dickson's Observations on Tetanus, and Dr. Macarthur's Letter in Vol.* 7, *p.* 448, *&c. of the same book. Trnka de Krzowitz, de Tetano Commentarius, Vindob.* 1777. *Richerand, Nosographie Chirurgicale, Tom.* 2, *p.* 338, *&c. Edit.* 4. *Edinb. Med. and Surgical Journal, Vol.* 1, *p.* 67; *Vol.* 2, *p.* 255—430; *Vol.* 4, *p.* 45, *&c. &c. Boyer, Traité des Maladies Chirurgicales, Tom.* 1, *p.* 285, *&c. Paris,* 1814. *And Rees's Cyclopædia, art. Tetanus.*

THORAX, WOUNDS OF. See WOUNDS OF THE THORAX.

THROAT, WOUNDS OF. Injuries of this kind are often attended with considerable danger, on account of the great number of important parts, which are interested; but, mere cuts of the integuments of the throat and neck are not (generally speaking) dangerous cases, and do not materially differ from common incised wounds of the skin, in any other part of the body. They are not liable to be followed by any particular consequences, and require the same kind of treatment, as cuts in general do. (See *Wounds—Incised Wounds.*)

In wounds of the throat and neck, however, the larynx and trachea, pharynx and œsophagus, the trunk of the carotid artery, and all the principal branches of the external carotid, the large jugular vein, the eighth pair of nerves, and the recurrent nerve, are all exposed to injury; some much more so, than others; but, all of them occasionally not escaping the edge of the knife, or razor, or the point of the sword, or other instruments.

It would certainly amount to absurdity, to offer an account of what is to be done, in cases attended with some part of the mischief above pointed out; for, no patient, thus wounded, would ever be found alive. Wounds of the eighth pair of nerves are universally considered by all surgeons as certainly fatal. These nerves, we know, proceed down the neck, in the same sheath of cellular substance, which includes the carotid artery, and lie on the outside of this vessel, between it and the internal jugular vein.

Wounds, either of the carotid artery, or internal jugular vein, must for the most part prove immediately fatal, in consequence of the great and sudden loss of blood, which would inevitably arise from an open, cut wound, interesting these vessels. However, were any surgeon on the spot at the moment, he should immediately tie the wounded vessel. One caution, however, is highly necessary in tying the carotid, viz. always to be sure, that the par vagum is excluded from the ligature; for were this nerve to be tied, this erroneous proceeding alone would remove every possibility of the patient's recovery.

If the mouth of the vessel could not be got at, pressure must be instantly resorted to, for the purpose of producing a temporary suppression of the hemorrhage. The surgeon should then either make the necessary enlargement of the wound in the integuments, with a due and constant recollection of the important parts near the place, or else, in the case of the carotid being injured, he should cut down to this vessel in the manner explained in the article *Aneurism.*

In lacerated wounds, the carotid artery may be injured, and yet the patient not immediately bleed to death; for, it is the nature of all wounds, attended with much laceration and contusion, not to bleed so freely as clean cuts. Mr. Abernethy has related a case, in which the carotid, and all the chief branches of it, were wounded in a man who was gored in the neck with a cow's horn; yet, death did not immediately follow, and there was time to have recourse to the ligature.

Punctured wounds might obviously injure, either the carotid, or the internal jugular vein, without the patient expiring of hemorrhage at once; because, the smallness of the wound in the skin, would sometimes hinder the fatal effusion of blood.

Often, however, when these vessels are wounded, the par vagum is injured at the same time, and the case is inevitably mortal, either immediately, from the direct effects both of the injury of the nerve, and sudden loss of blood, or very soon afterwards, the bleeding being of a slower, and more interrupted kind, which must depend on the lacerated nature of the wound, the small size of the opening in the vessel, or of that in the skin, &c.

Persons who attempt to commit suicide, by cutting their throats, do not often divide the carotid artery, on account of their incision being made too high up. Where the carotid arteries emerge from the chest, they are situated by the side of the trachea, and even a little more forward, than it. However, as these vessels proceed up the neck, they become more laterally situated with respect to the trachea; and when they have arrived at the upper part of the neck, where persons, who attempt to commit suicide, almost always cut, they become situated more backward, than the trachea, inclining towards the angle of the lower jaw.

The œsophagus is so deeply situated, lying close to the bodies of the vertebræ, and behind the trachea, that it is not often interested in any incised wounds, which do not immediately prove fatal, in consequence of the division of other important parts. We read of many cases, in which this tube is said to have been wounded, and what is usually set down as a criterion of the fact, is the passage of victuals through the wound. The writers of many of these narrations have proved themselves most grossly ignorant of anatomy, by not knowing, that wounds made above the os hyoides, as they frequently are, may enter the mouth, and hence the victuals may escape through the cut, without the œsophagus, or pharynx, being at all concerned.

However, no doubt, the œsophagus has occasionally been wounded, without the patient perishing so immediately, as not to be capable of receiving any succour. Stabs, and gunshot-wounds, might obviously injure the œsophagus, and leave other important parts untouched.

Even where the œsophagus is known to be wounded, its deep situation would prohibit us from doing any thing to the breach of continuity in the tube itself. The best plan would be to have recourse to antiphlogistic means, and to introduce a flexible elastic-gum catheter, from one of the nostrils, down the œsophagus, for the purpose of conveying nourishment and medicines into the stomach, without any risk of their getting out at the wound. An instrument of this kind will lie in the above situation, for any length of time, without occasioning much inconvenience, and, besides being advantageous for injecting nourishment and medicines down the passage, and keeping them from issuing at the wound, it prevents all necessity for the wounded œsophagus to act, and become disturbed, when there is occasion to take any kind of liquids, whether in the way of medicine, or food. The outer wound should be brought together, and treated on common principles.

When persons cut their throats, we have explained, that they do not often divide the carotid artery, owing to their incision being usually made high up in the neck, where this vessel has attained a very backward situation. When any serious hemorrhage does arise, it is sometimes from the lower branches of the lingual artery, but most frequently, from the superior thyroideal arteries. Such arteries may occasion a fatal bleeding, which, indeed, would more frequently be the event, than it actually is, did not the patient often faint, in which state the bleeding spontaneously ceases, and gives time for the arrival of surgical assistance.

I need hardly tell the reader, that these arteries are to be tied, and that this important object is the first, to which the surgeon should direct his attention. The danger of bleeding to death being obviated, as soon as possible, the other requisite measures may be more deliberately executed.

With respect to wounds of the trachea, the same plan of conveying food and medicines into the stomach, through an elastic-gum catheter, introduced from one of the nostrils, down the œsophagus, is highly proper, though too much neglected. For, nothing creates such disturbance of the wound as the convulsive elevation and depression of the larynx and trachea, which are naturally attendant on the act of swallowing.

When the trachea is cut, the patient's power of forming the voice is more, or less, impaired, in consequence of the air passing into, and out of, the lungs, chiefly through the wound. Besides air, a considerable quantity of the natural mucus of the trachea is also continually coming out of the wound.

The grand means of accomplishing the union of wounds of the trachea, are a proper position of the head, and a rigorous observance of quietude. By raising the patient's head with pillows, and keeping his chin close to his breast, the edges of the wound, both in the skin and trachea, are placed in contact, even without any other assistance, unless the division of the trachea be exceedingly large. It is proper, however, to assist the effect of a suitable position with strips of sticking plaster, and also, according to most authors, with a suture, or two. But, the necessity for sutures must depend on the extent of the division of the trachea; for, unless most of the circle of this tube be cut, and position be neglected, the wound in it will not gape. The stitches should never be passed through the lining of the trachea, as this method would be likely to make it inflame, and occasion considerable coughing, and irritation, which would have very pernicious effects on the wound.

Should there be much coughing, apparently arising from irritation and inflammation in the trachea, bleeding is proper, if other considerations do not forbid it. The spermaceti mixture with opium, is also frequently of great service. I never saw a wound of the trachea unite entirely by the first intention.

**THROMBUS.** (from ϑρομϐος, coagulated blood.) A clot of blood. The term has also been applied to a tumour, formed by a collection of extravasated, coagulated blood, under the integuments after bleeding. When such an extravasation, though of some extent, is not considerable, it is usually called an *ecchymosis.* (See this word, and also *Bleeding, Occasional ill-consequences of.*)

A thrombus sometimes depends on the surgeon having totally divided the vein; but, much more frequently on his not having made the opening in the vessel, properly correspond to that in the skin. The patient's altering the posture of his arm, while the blood is flowing into the basin, will often cause an interruption to the escape of the fluid from the external orifice of the puncture; and, consequently, it insinuates itself into the cellular substance in the vicinity of the opening in the vein. In proportion as the blood issues from the vessel, it becomes effused between the skin and fascia, covering the muscles, in the interstices of the cellular substance, and this, with more, or less rapidity, and in a greater, or lesser quantity, according as the edges of the skin impede more or less the outward escape of the fluid. Sometimes, also, a thrombus forms after venesection, when the usual dressings, compress, and bandage, have been put over the puncture, and the patient imprudently makes use of the arm, on which the operation has been done. This is more particularly liable to happen, when a very large opening has been made in the vein.

The accident is not attended with any danger, when the extravasation is inconsiderable; for, in this circumstance, the tumour generally admits of being easily resolved, by applying to it linen, dipped in any discutient lotion. If the swelling should be more extensive, applying to it a compress wet with a solution of common sea-salt, is deemed a very efficacious plan of promoting the absorption of the extravasated blood. Brandy, and a solution of the muriate of ammonia in vinegar, are likewise eligible applications.

It sometimes happens, that a thrombus induces inflammation and suppuration of the edges of the puncture. The treatment is now like that of any little abscess: a common linseed poultice may be applied, and any considerable accumulation of matter should be prevented by making an opening with a lancet in proper time. As soon as the inflammatory symptoms have ceased, discutients should be resorted to again, for the purpose of dispersing the remaining clots of blood, and surrounding induration.

When the quantity of blood is exceedingly large, authors generally recommend opening the tumour at once, and, despairing of the power of the absorbents to remove the extravasation, they recommended, as much of the blood as possible, to be pressed out through the incision. I believe, however, that making an opening is seldom necessary, and often brings on inflammation, and suppuration, when they might be avoided. I have never seen any case, in which there was real occasion to make an opening for the discharge of the blood. A case of this kind, however, may certainly be conceived.

**THYROID GLAND DISEASED.** (See *Bronchocele.*)

**THYROID GLAND, EXTIRPATION OF.** That such an operation, though attended with great difficulties, is not impracticable, is proved by the following example:

On the 20th of March, 1791, a woman presented herself for admission at the Hôtel Dieu, with a tumour of the right portion of the thyroid gland. The swelling was two inches in diameter, round, hard, and attached to the right and middle part of the trachea, and it pushed outwards the sterno-mastoideus muscle. Independently of its being sensibly raised by each pulsation of the arteries, it obeyed the motions of deglutition, and in a slight degree impeded the passage of solid aliment. The patient, earnestly desiring to get rid of so inconvenient a deformity, determined to submit to its extirpation, which appeared her only resource. The danger, the length of time, and the pain necessarily annexed to the operation, were not concealed from her. Desault made a longitudinal incision through the middle of the tumour, beginning one inch above, and finishing one inch below the swelling. In the first section he cut down as far as the gland, dividing the integuments, the platysma-myoides, and some fibres of the sterno-hyoideii and sterno-thyroideii muscles. An assistant, with the view of fixing the tumour, drew towards the left the inside edge of the wound made by the incision, whilst the surgeon detached the swelling from the sterno-mastoideus muscle. In dissecting the cellular substance which united the parts, two small arteries were divided, which were secured with ligatures. The external surface of the tumour being thus disengaged, the internal part was detached in the same way. The tumour was drawn outwards by means of a hook, that it might be separated with more ease from the trachea. In the course of this dissection, the branches of the thyroid arteries were successively tied, as fast as they were divided. The assistant, to whom the hook was confided, directed the gland from within and forwards, whilst the surgeon finished the dissection outwards and from above downwards. This part of the operation was the most minute and difficult: it was necessary by means of a sponge continually to wipe away the blood, which necessarily prevented the parts from being easily distinguished, and obliged the surgeon to divide but a little at a time, and previously to feel with his finger those parts which he was about to cut. By this cautious dissection of parts, the superior and inferior thyroid arteries were laid bare, and afterwards tied with the aid of a blunt crooked needle. They were afterwards transversely divided, and the remaining part of the tumour detached from the trachea, to which it strongly adhered. The wound resulting from this operation was near three inches in depth: it was outwardly bounded by the sterno-mastoideus muscle, and inwardly by the trachea and œsophagus; posteriorly by the carotid artery, and par vagum, which were exposed at the bottom of the wound. The extirpated tumour was five inches in circumference; and on examination was found to differ in no particular from scirrhous glands, except that in the centre there was a cartilaginous nucleus. The patient left the hospital, perfectly well, the 34th day after the operation. (See *Desault's Parisian Chirurgical Journal, Vol. 2, p.* 292—296.)

The extirpation of the thyroid gland is an operation extremely difficult, and certainly highly dangerous, when performed by an operator but moderately exercised in the practice of his profession. The number and size of the arteries necessary to divide, the proximity of the trachea, œsophagus, and carotid, near which the knife must necessarily pass, are the principal dangers which the operator should avoid. These are the circumstances which have deterred the majority of practitioners from performing it, and it must be allowed, that they are such as ought to intimidate every man, who is not endued with correct anatomical knowledge, and the most undaunted coolness. Examples of this operation are very rare. The first time that Gooch undertook it, he was deterred from finishing it by the hemorrhage, and his patient died on the eighth day. The second time he succeeded better, but was incapable of securing the vessels, and succeeded in stopping the hemorrhage, which would otherwise have been mortal, by causing the parts to be compressed by the hand of an assistant for the space of eight days. (*Gooch's Med. and Chir. Obs. p.* 130; *Bell's System of Surgery, vol.* 5, *p.* 525; *and la Bib. Chir. de Richter, t.* 2, 4*e partie, p.* 128.)

A. F. Vogel and Theden have practised the same operation with the most complete success. All danger from the hemorrhage, or inconvenience arising from the discharge of blood, may be obviated by taking up the small vessels, tying them as fast as they are divided, and by discovering and tying the large vessels previous to their division. Other parts that cannot be wounded without danger, are to be avoided by dissecting slowly and a little at a time, and feeling with the finger every part, previously to its division with the bistoury.

**TIC DOULOUREUX.** This term is used to signify a disorder, the most prominent character of which consists in severe attacks of pain, affecting the nerves of the face; most frequently, the filaments of that branch of the fifth pair, which comes out of the infra-orbitary foramen; but, sometimes the other branches of the fifth pair, and occasionally the numerous filaments of the portio dura of the auditory nerve, which are distributed upon the face. The complaint is not continual, but occurs in violent paroxysms, which vary in duration in different instances. It is the *trismus dolorificus* of Sauvage; the *Faciei Morbus Nervorum Crucians* of Dr. S. Fothergill; and of that order of diseases, which Professor Chaussier has so aptly denominated *neuralgies*, (from νευϱον a nerve, and αλγος, pain); for it should be known, that many other parts of the body are subject to a similar affection.

The first excellent description of the tic doulourenx was published in the year 1776, by the late Dr. Fothergill. (See *Medical Observations and Inquiries, Vol.* 5.) It is not true, however, as is generally stated in modern medical works, that this gentleman was the first author, who noticed the complaint. This, indeed, is so far from being correct, that we even find an account of an operation done long ago for the relief of the disease by M. Louis (See *No.* 36 *de la Gazette Salutaire,* 1766); and this identical case actually became a subject of hot dispute between the physicians and surgeons of the French metropolis. (See a Thesis read to the Faculty of Medicine there, entitled

"*Utrùm in pertinacibus capitis et faciei doloribus aliquid prodesse possit, sectio ramorum nervi quinti paris? Proponebat Viellart,* 1768, *conclusio negativa.*")

Tic douloureux conveniently admits of being divided into four species, called by the French *frontal, suborbitary,* and *maxillary neuralgia,* and the *neuralgia of the facial nerve.*

In the frontal neuralgia, the pain usually begins in the situation of the supra-orbitary foramen, extending at first along the branches and ramifications of the frontal nerve distributed to the soft parts upon the cranium, and afterwards shooting in the direction of the trunk of the nerve towards the bottom of the orbit. In a more advanced stage, the conjunctiva and all the surface of the eye participate in the effects of the disorder, and become affected with chronic inflammation, which is described as a particular species of ophthalmy. At length, the pain passes beyond the distribution of the branches of the frontal nerve, and affects all the corresponding side of the face and head. It seems as if it extended itself to the facial sub-orbitary, maxillary, and even to the temporal and occipital nerves, through the communications naturally existing between the filaments of all those organs of sensation. Each paroxysm produces a spasmodic contraction of the eyelids, and a copious effusion of tears.

The sub-orbitary neuralgia is first felt about the sub-orbitary foramen. Its seat is probably in the nerve of this name, and the pain extends to the lower eyelid, the inner canthus of the eye, the muscles about the zygoma, the buccinator, cheek in general, ala of the nose, and the upper lip. At a later period, the pain appears to extend backward to the trunk of the nerve, and those branches which are given off in its passage through the suborbitary canal. Hence, the pains are then experienced in the upper teeth, the zygomatic fossa, the palate, tongue, and within the cavity of the nose. As the disorder advances, it may extend, like all the other neuralgiæ of the face, to all the same side of the head. During the paroxysms, when the disease is fully formed, an abundant salivation usually takes place. In general, the attendant toothach deceives the practitioner, who, in the belief that the pain arises from another cause, uselessly extracts several of the teeth.

The tic douloureux of the lower jaw, or maxillary neuralgia, is usually first felt about the situation of the anterior orifice of the canalis mentalis, and it extends to the lower lip, chin, neck, teeth, and temple. This form of the complaint is more uncommon, than the preceding; but, after it has prevailed some time, is equally remarkable for its intensity.

With respect to the neuralgia of the facial nerve, or portio dura of the auditory nerve, it is a case, which very soon cannot easily be distinguished from the other species of tic douloureux. The pains at an early period are no longer confined to the passage of the principal branches of this nerve between the parotid gland and ramus of the jaw. The numerous communications of the portio dura with the rest of the nerves of the face seem to facilitate the extension of the disease, so that the agony is soon felt over the whole side of the head. The original source of the disorder can only be detected by attentively considering the progress of the complaint in all its stages. (See *Delpech, Traité des Maladies Reputées Chirurgicales, Tom.* 3, *Sect.* 7, *p.* 214, *&c.*)

Tic douloureux may be known from rheumatism by the paroxysm being excited by the slightest touch; by the shortness of its duration, and the extreme violence of the pain. In acute rheumatism, also, there is fever, with redness, heat, and generally some degree of swelling; and in chronic rheumatism the pain is obtuse, long continued, and often increased at night; none of which symptoms characterize tic douloureux.

It may easily be distinguished from hemicrania by the pain exactly following the course of the branches of the affected nerve.

It is known from the toothach by the comparative shortness of the paroxysms; the quickness of their succession; the intervals of entire ease; the darting of the pain in the track of the particular nerve affected; the more superficial and lancinating kind of pain; and the convulsive twitchings, which sometimes accompany the complaint.

The causes of tic douloureux may be said to be in general unknown; but, there are a few instances recorded, which appeared to be the consequence of external violence, wounds, contusions, &c. A modern writer has related a very curious instance of a resembling disease in the arm, where the affection proceeded from the lodgment of a small bit of a bullet in the radial nerve. (*Denmark in Medico-Chir. Trans. Vol.* 4, *p.* 48.)

Stimulating embrocations, blisters, caustic issues, fomentations, leeches, frictions with mercurial ointment, (*Edinb. Med. and Surgical Journ. Vol.* 3.) electricity, opium in large doses, the arsenical solution, and a variety of antispasmodic medicines, are the principal means, which have been tried; but for the most part, they only afford partial and temporary relief. From some facts, recently published by Dr. Marcet, the extract of stramonium, in doses of $\frac{1}{8}$ and $\frac{1}{2}$ a grain thrice a day, seems to be sometimes capable of alleviating the distressing agony of the present disorder. (See *Medico-Chirurgical Trans. Vol.* 7, *p.* 75, *&c.*)

The operation of dividing the trunk of the affected nerve, and even of dissecting out a portion of it, so as to prevent all chance of a relapse from the reunion of the ends of the nerve, is the plan, which has sometimes been practised with permanent benefit. Thus, any one of the three branches of the fifth pair of nerves may be divided at the point, where it comes out upon the face. But, before having recourse to this means, the surgeon should be sure, that the particular nerve, which he is about to expose and divide, is really the principal seat of the disease; for, when all the nerves of the face generally are affected, or when the branches of the portio dura are especially concerned, there is little hope of success. In fact, it must be confessed, that the operation has had many failures and relapses, either from the cases not having been duly discriminated, or from the neglect to remove a portion of the exposed nerve. Richerand, Delpech, and most of the leading surgeons in France express their preference to the application of the moxa, or cautery, which they say proves more frequently successful, than the knife. This should be done directly over the apertures, from which the nerves emerge on the forehead, cheek, or chin, and Richerand asserts, that, by such treatment, the pains may always be cured, or at all events, rendered supportable. (*Nosographie Chir. Tom.* 2, *p.* 218, *Edit.* 4.) Delpech also affirms, that the section of the nerve very often fails, and that issues, and the repeated use of the cautery have been attended with the greatest success. (See *Précis des Mal. Chir. T.* 3, *p.* 213.) The disfigurement of the countenance by burning applications must, however, be very objectionable, and, as I think there is no positive evidence of the superiority of this method over the use of the knife, I consider what Richerand and Delpech have stated only as another instance of the extreme partiality of the French surgeons to the moxa and cauterization. Delpech confesses, however, that, when the pains seem to be the consequence of a ganglion, or thickening of a part of a nerve, the excision of such part is indispensable. There can be little doubt, that this would have been more proper, than amputation in Mr. Denmark's case, to which I have already referred.

There have been many examples of tic douloureux, which, after resisting all attempts to cure them, have been left to themselves, and, after a long time, spontaneously subsided. (*Delpech, Traité des Maladies Chir. T.* 3, *p.* 212—215.) This author has seen the operation of dividing the chief branches of the portio dura in front of the parotid gland undertaken, and even a portion of the soft parts cut away; but, without any favourable consequences. (*P.* 218.)

I have already stated, that the nerves of the extremities are subject to affections very analogous to tic douloureux. The following instance related by Mr. Abernethy will be found interesting:

A lady became gradually affected with a painful state of the integuments under and adjoining to the inner edge of the nail of the ring-finger of the left hand. No injury to the part was remembered which could have brought on this disease. The pain occurred at irregular intervals, and was extremely severe during the time of its continuance, which was for a day or two, when it usually abated. Accidental slight injuries always produced great pain, and frequently brought on those paroxysms, which however occasionally occurred spontaneously, or without any evident exciting cause. In all these particulars, the disease correctly resembled the tic douloureux of the nerves of the face. As the pain increased, the disorder seemed to extend up the nerves of the arm. After the patient had endured this painful affliction for seven years, she submitted to have the skin, which was the original seat of the disorder, burned with caustic. This application gave her intense pain, and, on the healing of the wound, she found her sufferings rather augmented than diminished by this experiment. After four more years of suffering, she consulted Mr. Abernethy, when the circumstances of the case were such as to render an operation indispensably necessary. The pain of the part was intolerable, and it extended all up the nerves of the arm; and this general pain was so constant during the night, as to deprive the patient of rest. The muscles of the back of the neck were occasionally affected with spasms. The integuments of the affected arm were much hotter than those of the opposite side, and sometimes the temperature was so increased as to cause a burning sensation in them. Under these circumstances, Mr. Abernethy did not hesitate to divide the nerve of the finger, from which all this disorder seemed to originate. He laid it bare by a longitudinal incision of about three quarters of an inch in length, from the second joint of the finger, and divided it opposite to that joint, by a curved sharp-pointed bistoury, which was conveyed under it. He then took hold of the nerve with a pair of forceps, and reflecting it downwards, removed a portion of it, half an inch in length, that the possibility of a quick reunion might be prevented. The wound was brought together by sticking plaster, and it united by adhesion; but, the upper part of the wound, opposite to the upper end of the nerve, became slightly inflamed, and was very painful. However, the appearance of inflammation gradually went off in the course of three weeks. After the operation, Mr. Abernethy pinched the originally affected integuments sharply with his nails, without causing any sensation; but if, in so doing, he moved the finger, then pain was felt. Mr. Abernethy found it difficult to convince the patient, that the skin at that part was actually devoid of sensation, for she still continued to feel similar sensations to those, which formerly occurred, though in a much diminished degree: but she became gradually as perfectly convinced as any medical man could be, that these sensations arose from the irritated state of the end of the nerve, above the place where it was divided. The painful affection of the nerves of the arm still continued, though considerably lessened in violence; however it was sufficiently severe to make the patient apprehend, that little permanent benefit would arise from the operation. This pain continued occasionally about four months with varying degrees of severity, but the temperature of the skin was not hotter than that of the opposite side, as it had been before the operation. At the expiration of three months, the patient ascertained, that the integuments at the end of the finger actually felt when any thing was applied to them, and this proved a new source of alarm. Mr. Abernethy adds, that more than nine months have now elapsed, since the performance of the operation, and the general pains in the nerves have become very trivial; but, the sensation of the integuments at the end of the finger, has during that time gradually increased, and the skin has now its natural sensibility, so as accurately to distinguish the tangible properties of any body applied to it. If also the originally affected part be slightly compressed, painful sensations resembling those which formerly occurred take place. (*Abernethy's Surgical Works, Vol.* 2, *p.* 203.)

Mr. Lawrence once mentioned to me a case resembling the former, and which was the consequence of a wound of the finger. This gentleman also cut down to the nerve, and removed a portion of it, with permanent success.

Consult particularly *Dr. Fothergill's Paper in vol.* 5, *of the Medical Observations and Inquiries. Dr. Haighton's Obs. in the Medical Records and Researches. Darwin's Zoonomia. Abernethy's Surgical Works, Vol.* 2, *p.* 203, *&c. Richerand's Nosographie Chirurgicale, T.* 2, *p.* 216, *&c. Edit.* 4. *Delpech Précis des Maladies Chir. T.* 3, *p.* 206 *&c. Dr. S. Fothergill's Systematic Account of Tic Douloureux*, 1804. *Medico-Chir. Trans. Vol.* 4, *p.* 48, *Vol.* 7, *P.* 575, *&c.*

**TINCTURA CANTHARIDIS.** (*lyttæ.*) Surgeons sometimes employ this medicine, in cases of gleets, and incontinence of urine, arising from a want of proper action in the sphincter vesicæ muscle. The usual dose is from ten to forty or sixty drops, twice or thrice a day; but its effects should be vigilantly attended to; for, it is apt to occasion dangerous inflammations of the urinary organs, violent stranguaries, and retentions of urine.

Tincture of cantharides has occasionally been used as an ingredient in various liniments, when the object has been to stimulate the skin, and rouse the action of the nerves and absorbents, as in certain cases of ptosis, paralysis, &c.

**TINCTURA FERRI MURIATI.** The writer of the Pharmacopœia Chirurgica remarks, that the tinctura ferri muriati has sometimes been exhibited "for gleets; but a more important use has been assigned it by Mr. Cline, who orders it in dysuria, when a consequence of *stricture*, in the dose of ten drops every twenty or thirty minutes. This relaxes the spasm, through which the retention is occasioned, by a mode of operation not easily explained.

"Mr. Justamond's liquid for external use in cancers, and which the original inventor called his *panacea anticancrosa*, partook considerably of the nature of this tincture, which, indeed, with an equal quantity of spirit of wine, was sometimes substituted for it.

"Lastly, it is remarkably efficacious in destroying venereal or other warts, either used alone, or diluted with a small proportion of water."

**TINCTURA THEBAICA.** ℞. Opii purificati ʒij. Cinnamomi, Caryophyllorum, sing. ʒj. Vini, albi lib. j. These are to be macerated, without heat, for a week, and then filtered.

This was one of the formulæ of the old London Dispensatory, and though the tinctura opii is now substituted for it in that work, yet, in one particular surgical case, it is found that the tinctura thebaica cannot be superseded by the other preparation, without great disadvantage to the patient: I allude to inflammation of the eyes. The late Mr. Ware found the tinctura thebaica, in this instance, eminently serviceable. His plan was to put one drop of it into the eye, once or twice a day, according as the symptoms were more or less violent. When first applied, it causes a sharp pain, accompanied with a copious flow of tears, which continues a few minutes, and gradually abates; after which a greater and remarkable degree of ease generally succeeds. This gentleman observes, that "the inflammation is often visibly abated by only one application of this tincture; and many bad cases have been completely cured by it in less than a fortnight, after every other kind of remedy had been used for weeks, and sometimes months, without any success. But this speedy good effect is not to be expected in all cases indiscriminately. In some, the amendment is more slow and gradual, requiring the tincture to be made use of for a much longer time; and a few instances have occurred, in which no relief at all was obtained from its first application. In cases of the latter kind, in which the complaint is generally recent, the eyes appear shining and glossy, and feel exquisite pain from the rays of light. However, notwithstanding these symptoms, the application is sometimes found to succeed; and whether it will or not, can only be determined by making the trial; which is attended with no other inconvenience than the momentary pain it gives. When it is found to produce no good effect, the use of it must be suspended, until evacuations, and other proper means, have diminished the excessive irritation; after which, it may again be applied, and bids equally fair for success, as in those instances, in which it never disagreed.

If two or three drops of the thebaic tincture are applied at once to the globe of the eye, the pain they occasion will be considerably greater than if they are placed in the inner angle of the eyelids, and made to glide gradually on the eye, by gently drawing down the lower lid. At the same time that this latter mode of applying the tincture is much less painful than the former, Mr. Ware has found, in a great variety of cases, that it is equally beneficial. (See *Ware's Remarks on Ophthalmy, &c.* his *Additional Remarks* on the same subject; and the article *Ophthalmy* in this Dictionary, at which part of the book, the particular cases, in which the application can be judiciously made, are pointed out.) The reader should be well apprised, that the tinctura thebaica cannot be made indiscriminate use of for all inflammations of the eyes, without doing serious mischief in many instances.

**TINEA CAPITIS**, or Porrigo, (called also *Ringworm of the Scalp; Scald-head, &c.*) is, according to Dr. Bateman's excellent account of the subject, a contagious disease, principally characterized by an eruption of the pustules denominated *favi* and *achores*. The *achor* is defined to be a small acuminated pustule, containing a straw-coloured matter, which has the appearance and nearly the consistence of honey, and is succeeded by a thin brown, or yellowish scab. The *favus* is larger, flatter, and not acuminated, and contains a more viscid matter; its base, which is often irregular, is slightly inflamed; and it is succeeded by a yellow, semi-transparent, and sometimes cellular scab, like a honeycomb; whence, it has obtained its name. (See *Bateman's Synopsis of Cutaneous Diseases*, p. xxiv and 159, *Edit.* 3.)

This intelligent physician has noticed six species of porrigo, of which my limits will allow me to give only a very abridged description.

1. The *Porrigo larvalis*, or *crusta-lactea* of authors, begins with an eruption of numerous minute whitish *achores*, upon a red surface. These pustules soon break, and discharge a viscid fluid, which concretes into thin yellowish, or greenish scabs. The disease increases in extent, and the scabs become thicker and larger, until the forehead, cheeks, and even the whole face, excepting the eyelids and nose, become enveloped, as it were, in a mask, whence the epithet *larvalis*. Small patches of the disease sometimes appear about the neck and breast, and on the extremities; and the ears and scalp are usually affected in the progress of the case. The infant suffers more or less from the itching and irritation. When the discharge is copious and acrid, Dr. Bateman recommends the part to be washed two, or three times a day with tepid milk and water, and the application of the unguentum zinci alone, or mixed with the saturnine cerate. The latter, he says, will be useful for the relief of the excoriation, left after the cessation of the discharge. Small doses of the submuriate of mercury, either alone, or in combination with a testaceous powder, will also expedite the cure. If the bowels are very irritable, the hydrargyrus cum creta, or the cinereous oxide, may be exhibited, instead of the calomel. When the health is good, soda, precipitated sulphur, and the testacea, will lessen the local inflammation and discharge.

When the irritation is removed, and the crusts are dry and falling off, the unguentum hydrarg. nitrat. much diluted, may be used, and the decoction of bark, or the vinum ferri prescribed.

2. *Porrigo furfurans* begins with an eruption of small *achores:* The excoriation is slight, and the discharge, which is not abundant, soon concretes, and falls off in innumerable thin laminated scabs. At irregular periods, fresh pustules arise, and follow the course of the preceding. The complaint is confined to the scalp, which is affected with itching and soreness; and the hair, which partly falls off, becomes thin, less strong, and sometimes of a lighter colour, than natural. This species of porrigo occurs principally in adults, and it is sometimes attended with swelling of the glands in the neck. Dr. Bateman observes that the treatment requires the hair to be closely cut off the scalp. The branny scabs are then to be gently washed away with some mild soap and water twice a day; and an oil silk cap should be worn. In the beginning, when the surface is moist, tender, and inflamed, the zinc ointment, or one made with ʒij. of the cocculus indicus and ℥j. of lard. Afterwards, when the scalp is dry and free from irritation, it

may be washed with common soft soap and water; or with a mixture of equal parts of soft soap and unguentum sulphuris. Then the unguentum hydrargyri nitrati, the ung. hydrarg. nitrico oxydi, the tar and sulphur ointments, or the ung. acidi nitrosi of the Edinb. Pharm. may be employed. These last stimulant applications, however, must be left off, if the inflammation and discharge return.

3. *Porrigo lupinosa* is characterized according to Dr. Bateman by dry, circular, yellowish white scabs, set deeply in the skin, with elevated edges, and a central depression, and somewhat resembling on the whole, the seeds of lupines. These scabs are formed upon separate clusters of *achores*, and attain on the scalp the size of a sixpence; but, when on the extremities, they are not more, than two lines in diameter.

In the treatment of the porrigo lupinosa, the scabs are first to be gently washed off with some soap and water, and the scalp is to be shaved, if it be the part affected. When the scabs are difficult of removal, the liquor potassæ, or a weak lotion of muriatic acid may be used for loosening them. Then the ointment of cocculus indicus is to be applied to the red cuticle, and afterwards any of the more stimulant ointments above enumerated.

4. *Porrigo Scutulata*, or *ring-worm of the Scalp*, as Dr. Bateman has observed, makes its appearence in separate patches, of an irregularly circular shape, upon the scalp, forehead, and neck. It commences with clusters of small, light yellow pustules, which soon break, and form thin scabs, which, if neglected, become thick and hard. If the scabs are removed, however, the surface underneath is left red and shining, but, studded with slightly elevated points, or pustules. When the disorder is neglected, the patches become confluent, and the whole head affected. Where the disease is situated, the hair becomes lighter in its colour, it falls off, and its roots are destroyed. The porrigo scutulata generally occurs in children three or four years old and upwards, and frequently proves exceedingly obstinate. According to Dr. Bateman, it seems to originate spontaneously in children of feeble and flabby habit, and who are ill-fed, uncleanly, and not sufficiently exercised; but, he thinks that it is chiefly propagated by contagion, i. e. by the actual conveyance of the matter from the diseased to the healthy, as may happen in the frequent contact of the heads of children, the use of the same towels, combs, caps, and hats.

While the patches are inflamed and irritable, it is necessary to limit the local applications to washing the parts with warm water. Even shaving the scalp, which must be repeated at intervals of eight or ten days, produces a temporary irritation. Nothing but a light linen cap is now to be worn, and it must be often changed.

The disease afterwards forms dry scabs, and becomes for a time less irritable; but a fresh eruption of achores soon follows, and the inflammation and redness return.

In the inflamed states, Dr. Bateman recommends the use of ointments, made either with the cocculus indicus, submuriate of mercury, oxide of zinc, superacetate of lead, opium, or tobacco; or else the infusion of poppy heads, or tobacco. Where there is an acrimonious discharge, Dr. Bateman prescribes the zinc, or saturnine ointments, the ung. hydrarg. præcip. calomel ointment, or a lotion of lime water and calomel.

In the less irritable stages, the ung. hydrarg. præcip. the ung. hydrarg. nitrico-oxydi, and especially the ung. hydrarg. nitrat. are often effectual remedies. So are the ointments of sulphur, tar, hellebore, and turpentine, and lotions of the sulphates of zinc and copper, the oxymuriate of mercury. I have often seen a solution of ʒj. of the sulphuret of potassa in a pint of lime water, succeed when most other applications had failed. In the very dry and inert state of the patches, Dr. Bateman has seen the disease removed by a lotion, containing from three to six grains of the nitrate of silver in an ounce of distilled water. The application of the diluted mineral acids, or of a blister, has also been known to put a permanent stoppage to the morbid action.

In general, no local application agrees well, if long continued, and it is necessary to have several, which must be alternately employed.

The cure may often be expedited by cinchona, chalybeate, and alterative medicines; and attention must be paid to the patient's diet, exercise, &c.

5. *Porrigo Decalvans* consists in bald patches, surrounded by hair, which is as thick as usual. It is not known, whether any eruption of minute achores actually precedes the detachment of the hair.

Dr. Bateman remarks, that if the scalp is regularly shaved, and some stimulating liniment be applied to it, this obstinate affection may at length be overcome, and the hair will regain its usual strength and colour. Two drams of oil of mace in three or four ounces of alcohol, are said to make an excellent liniment.

6. *Porrigo favosa* consists of an eruption of the large, soft, straw-coloured flattened pustules, denominated *favi*, which may occur on any part of the body; but most commonly spread from the scalp, especially behind the ears, to the face, or from the lips and chin to the scalp. They are attended with considerable itching, and are most frequently seen in children from six months to four years of age, though adults

are also often affected. The pustules pour out a viscid matter, which concretes into greenish or yellowish semi-transparent scabs. When the hair and moist scabs are matted together, pediculi are often generated in great numbers, and aggravate the itching and irritation. If the disease be allowed to increase, the scabs are thickened into irregular masses, not unlike honey-comb; and considerable ulcerations sometimes form, especially when the heel and toes, or other parts of the lower extremities are affected. The ulcerating blotches are generally soon followed by irritation and swelling of the lymphatic glands, which sometimes slowly suppurate. The contact of the discharge inoculates the disease; thus, in young children the breast is inoculated by the chin; and the arm and breast of the nurse may be infected in the same way; though adults do not take the complaint so quickly as children.

The porrigo favosa requires the same alteratives internally, as the porrigo larvalis. The diet should consist of milk, puddings, and a little plain animal food. When the habit is bad, and the glands swelled, bark, chalybeates, and a solution of the muriate of barytes, are proper.

As local applications, Dr. Bateman prefers the unguentum zinci, or the ung. hydrarg. præcip. mixed with this or the saturnine ointment, especially, when the discharge is copious. He also speaks favourably of the ung. hydrarg. nitrat. the strength of which is to be diminished by an addition of simple cerate, according to the degree of irritation present.

For the preceding particulars I am indebted to Dr. Bateman's valuable Synopsis of Cutaneous Diseases, where the reader, desirous of additional information, respecting porrigo, will be amply gratified.

**TOBACCO** is used for promoting the reduction of strangulated hernia. For this purpose it is employed either in the form of a fluid glyster, or of smoke, which latter is introduced up the rectum by means of an apparatus. Excepting the operation, the power of tobacco, particularly, when assisted with the topical application of cold to the tumour, is most to be depended upon in bringing about a return of the protruded viscera. (See *Hernia*, and also *Enema*.) It has also been tried in tetanus, but without success; and Mr. Earle has found tobacco clysters very efficacious in certain cases of retention of urine. See *Tetanus*, and *Urine, Retention of*.

**TONGUE, DISEASES OF.** This part is subject to various diseases, as ulcers, tumours, and such enlargements as sometimes put the patient into imminent danger.

Carious teeth, with points and inequalities, occasioning incessant irritation, are the most frequent cause of ulcerations of the tongue. The sores, thus produced, often resist every kind of remedy, and ignorance of the cause sometimes leads the practitioner to consider them as incurable; whereas, a cure might easily be effected by extracting the carious tooth, or simply filing off its sharp irregularities and pointed parts. This advice is exceedingly ancient, being mentioned even by Celsus.

The glandular papillæ which are situated on the dorsum, or upper surface of the tongue, are naturally formed with a narrow base, and a broad termination or head, like a mushroom. They are capable of becoming considerably enlarged, so as to form preternatural tumours which may be very improperly mistaken for cancerous excrescences.

A young man, eighteen years of age, had on the middle of his tongue a circumscribed tumour, about as large as a middle-sized nutmeg. M. Louis, who was consulted, perceived that the swelling was only of a fungous nature, and he tied its base with a ligature, with the noose of which he contracted the diameter of the pedicle, while, with the ends, he kept down the tongue. Then, with one stroke of a pair of curved scissars, he cut off the tubercle. M. Louis afterwards applied caustic, with the requisite precautions, to the base of the tumour, and the patient got perfectly well in five or six days. (*Mémoires sur les Maladies de la Langue in Mémoires de l'Acad. de Chirurgie, Tom. 5.*)

Morgagni speaks of similar tubercles; but he had never advised their extirpation, not even when they had become hard and scirrhous; for, if he had not deemed the operation impracticable, he would not have had any confidence in the skill of the surgeons employed. (*De Causis et Sedibus Morborum.*)

The tongue is occasionally affected with a true cancerous disease; one of the most afflicting cases, indeed, to which mankind are exposed. M. Louis saw a lady, who had an ulcerated cancerous tubercle on the left edge of the tongue. The little swelling was circumscribed; its size did not exceed that of a filbert; the pains were lancinating; the sore had penetrated deeply; and its tuberculated edges were affected with a scirrhous hardness. Extirpation of the disease seemed to present the only chance of freeing the patient from the terrible disorder; but, she refused to accede to any thing but palliative plans, and she died in the course of a few months.

Forestus makes mention of four women, who were attacked with cancer of their tongues, and died from the ravages of the disease, and hemorrhage. In the writings of Fabricius Hildanus, there is a description of the origin and progress of a cancerous tubercle on a young man's tongue, who had a most intolerable fetor of the breath, and died, suffering the most excruciating pains. The same author informs us of another case, exhibiting the good effects of sedative remedies in palliating a cancerous ulcer of the tongue, and the fatal consequences of an opposite line of conduct. In authors, many other examples, of the same kind, are to be met with.

Surgery, however, is not destitute of resources against diseases of so formidable a nature. The following case will serve to shew, what benefit may be effected by this useful profession, when not exercised by men of too timorous a character.

An elderly woman had an ulcerated hardness on her tongue. It had been several times cut away, and as repeatedly returned. Ruysch was called in to a consultation with one of the surgeons, who was attending the patient, and who had already extended his incisions very deeply for the removal of the disease. The result of their deliberations was another attempt to extirpate the tumour, and they also determined, that after it had been cut away, the actual cautery should be freely applied, with a view of destroying the roots of the fungus. The patient consented to the plan, and bore the operations with great fortitude. The tongue was taken hold of with a cloth, and Pierre Le Memnonite, a surgeon of eminence, removed the disease with a curved bistoury. The inside of the mouth was then protected with wet cloths, and the actual cautery applied, several times to the wound in the tongue. The pain was appeased, and the separation of the eschar promoted by emollient gargles. The place soon healed, with the aid of what were called vulnerary decoctions, containing honey of roses, and the tincture of myrrh and aloes.

It is much easier to cut off a complete portion of the tongue, through all its diameter, than to remove a cancerous ulceration, situated on one of its edges.

In both cases, there is a good deal of difficulty in fixing the part, for it is so very moveable, that it is not easy to keep it in a steady position. M. Louis recommended, for this purpose, the employment of forceps, with blades which terminate in hook-like extremities. With this instrument, the part of the tongue to be amputated can be kept from slipping away from the operator.

Cruel as the operation of removing the tongue may appear, the surgeon should not hesitate to perform it, whenever the disease has made a certain progress, and is decidedly of a cancerous nature.

It should be noticed, however, that very malignant ulcers on the tongue have sometimes been cured by milder means. Sores of this description are reported to have yielded to the repeated application of leeches under the tongue, after a vast number of other remedies had been tried in vain. In the *Encyclopédie Méthodique, Art. Langue*, there is an account of a very alarming affection of the tongue, (reputed to be cancerous, though this may be doubted,) which got completely well under a very simple plan of treatment. A woman, thirty-five years of age, subject to cutaneous diseases, and ill-conditioned ulcers, complained, for seven or eight months, of little swellings, accompanied with heat and pain, which made their appearance on the edge, and towards the apex, of the tongue. At length, the part affected began to swell, grow hard, and cause lancinating pains. Its surface became irregular and rough; and all the side of the tongue was considerably swelled. The patient could not put her tongue out of her mouth, nor swallow any thing except liquids; and her breath was intolerably fetid. Various sedative remedies had been employed without success. Cicuta had been used as a topical application; it had been exhibited internally in large doses; the patient had taken, for a long while, the oxymuriate of mercury; but nothing proved of any avail. At length, the patient was so tired of trying the effect of medicines and applications, that she gave them up entirely; and contented herself with trying the experiment of keeping some honey continually in her mouth. As this method seemed to give her some ease, she was prevailed upon to persist in it, and, in this way, the pains were gradually appeased; the swelling was diminished, and, at the end of two or three months, the woman got quite well, except that an indurated cicatrix remained on the part affected, and considerably obstructed the extension of the tongue on that side.

On this case, however, it might be remarked, that the retardation of the cure seems also ascribable to the injury of the health produced by the hemlock, mercury, &c. and that the amendment, following their discontinuance, might arise from the consequent improvement of the patient's health.

Many writers have confirmed the fact, that very inveterate diseases of the tongue are sometimes cured by hemlock. In the work, last cited, is mentioned an instance of a very unhealthy-looking ulcer, near the apex of the tongue, attended with a considerable thickening of the part, and of some duration, which was cured by giving large doses of cicuta.

However, notwithstanding many facts of this kind on record, medicines should not be tried too long, that is to say, so as to let the disease attain a condition, in which it will no longer admit of being cut away. When the disease makes progress, the knife should be employed, before it is too late.

When any part of the tongue is to be amputated, the surgeon is to be prepared for putting a stop to the hemorrhage. Authors very properly recommend the chief vessels to be tied, if possible; but, when this cannot be accomplished, they advise the employment of astringent gargles, such as a strong solution of alum, distilled vinegar, or diluted sulphuric acid. When these methods fail, the continental surgeons recommend the actual cautery as the only resource. Some surgeons, however, impressed with the horror of red-hot irons, might think it better to tie the trunks of the lingual arteries, as they pass over the os hyoides. A patient should undoubtedly never be suffered to die of bleeding, and some bold step ought certainly to be taken; but, I cannot presume to decide, which of the two latter measures is the best. Perhaps, by a practitioner, well acquainted with anatomy, the last one should be preferred.

The whole of the tongue sometimes inflames, and becomes considerably enlarged, either spontaneously, and without any apparent cause, or in consequence of some other disease; or else from some particular irritation; such as that of mercury, or some poisonous substance. Slegel, a German physician, who was at Paris about the middle of the 17th century, saw a patient in a salivation, whose tongue became so enormously enlarged, that the mouth could not contain it. Pimprenelle, an eminent surgeon of that time, was sent for, and finding that all trials to relieve the affection were in vain, amputated one half of the tongue, with a view of preventing its mortification. When the wound was healed, it is said, that the patient could articulate as well as before. M. Louis, from whom this fact is quoted, very justly remarks, that the measure resorted to by M. Pimprenelle was an exceedingly violent one; for he has often seen urgent symptoms occasioned, during a salivation, by a rapid and enormous swelling of the tongue, very quickly yield to bleedings, purgative glysters, change of air, and leaving off mercury. Two or three facts, confirming this statement, have fallen under my notice since the last edition of this Dictionary.

Trincavellius mentions two women, who had considerable enlargements of their tongues. One of these patients, who was young, had been rubbed with mercurial ointment even on her head; and the other, who was about fifty years old, had her tongue attacked with the ravages of the small-pox. The excessive swelling of the tongue, in both these instances, terminated in resolution, and a separation of its outward membrane.

When the urgency is such, that an immediate diminution of the swelling becomes necessary for the relief of the symptoms, nothing, it is said, is attended with so much success, as at once making one or two deep incisions along the tongue. This, it is added, is particularly proved by the cases, inserted by M. de la Malle, in the fifth volume, 4to. of the *Mem. de l'Acad. de Chirurgie*, and by some others, related by M. Louis in the paper above cited. Such cases are extremely interesting, and seem to merit an insertion in this Dictionary.

A man, who was recovering from a bad fever, was suddenly attacked with a pain in his tongue, followed by a swelling equally large and rapid in its formation. In less than five hours, the part became thrice as large, as it is in its natural state and, in this space of time, M. de la Malle, who had been consulted, had bled the patient successively in his arm, neck, and foot. The man felt very acute pain; his skin was excessively hot; his face was swelled; his pulse was hard and contracted; and his look wild. He could hardly breathe; the tongue filled all the cavity of the mouth, and protruded out between the lips. In this very urgent case, the surgeon had recourse to no other expedient, than keeping the mouth a little more open than it was made to be by the swelling of the tongue, and making with a knife three parallel incisions along this organ, one along its middle, and the other two between the one in the centre and the edges of the part affected. The cuts extended through two-thirds of the preternatural swelling, and had all the good effect which could possibly be desired. There was a great deal of hemorrhage, and the enlargement of the tongue subsided so much, that, an hour after the operation, the patient was able to speak. The next day, the incisions had the appearance of being only superficial scarifications, and the tongue was in its natural state. In short, the incisions healed in a few days, the patient having merely made use of a simple gargle.

M. de la Malle quotes several other cases, all of which tend to shew the success, which he has met with in applying this practice to other similar cases. He confirms his own sentiments, by quoting the testimony of some authors, antecedent to him, who have recommended the method; and, in particular, he cites a case, in which Job à Meckren, an eminent Dutch surgeon in the middle of the seventeenth century, adopted this practice, in a case, where the tongue, together with the tonsils and palate, became spontaneously affected with a sudden and dangerous degree of swelling.

It may be concluded from the preceding observations, that making incisions into the tongue would have saved numerous patients, who have been suffocated, in consequence of enormous enlargements of this organ. In the small-pox, the tongue sometimes becomes immensely swelled; and, it is more than probable, that, in many instances, the employment of the above method would have afforded great relief to patients, whom the disease has been known to have entirely bereaved of the power of swallowing. (See *Mémoire sur les Maladies de la Langue, dans les Mémoires de l'Acad. de Chirurgie, Tom.* 5. *Mem. de M. Malle; same Work. Encyclopédie Méthodique, Partie Chirurgicale, Art. Langue.*)

**TONSILS.** (dim. of *tolæ*, the kernels.) *Tonsillæ. Amygdalæ.* The tonsils, like all the other parts at the back of the mouth, are subject to different kinds of swelling, which vary as much in their nature as their consequences. Some are rapid in their progress, and these are frequently observed to affect persons of, what is termed, a sanguineous temperament. They are also prone to attack young people, and such as labour hard, and they have all the essential characters of inflammation.

Other swellings of the tonsils are slower in their progress, occur in damp cold weather, and in indolent, and, what the old physicians used to call, phlegmatic constitutions.

Lastly, another kind of enlargement of the tonsils, which is usually contagious, readily falls into a sloughing, gangrenous state, sometimes extends to the neighbouring parts, and too often proves fatal. Hence, the various species of angina have been named by some writers inflammatory, catarrhal, and gangrenous. The two first kinds frequently terminate in resolution; but, sometimes, the affected tonsils afterwards assume a scirrhous hardness, obstruct respiration and deglutition, so that it becomes indispensably necessary, either to extirpate the diseased parts, with the ligature, or the knife.

The cutting away of enlarged tonsils was an operation, which was performed by the ancients, and, in different ways. Sometimes, they tore with their fingers the membrane covering the tonsil, and then pulled this part out of the situation, which it occupies between the two pillars of the velum pendulum palati. In other instances, in which they experienced too much resistance, they seized the diseased tonsil with a kind of hook, and then cut it away with a bistoury, which, Paulus Ægineta informs us, was concave on the side towards the tongue.

The moderns, who, for a long while, were timid in the employment of both these methods, adopted plans of a more cruel description. The actual cautery was proposed, and some partial success, which followed its use, at once established its reputation. Caustics were afterwards employed, instead of actual fire; but, the inconvenience of not being able to limit their action, and the hazard of their falling down the œsophagus, soon caused them to be relinquished by all rational practitioners. Then the operation of cutting away the tonsils was revived, and it was performed, sometimes in the manner of the old surgeons, sometimes with various kinds of curved scissars, or knives. Instead of the simple tenaculum used by the ancients, a sort of double one came into fashion. Every practitioner seemed to regulate the choice of his instruments, by his own ingenuity; and an operation, which was capable of being done at once, became complicated by being divided into several processes.

Bichat describes the following plan, as the common one practised at the present day.—The patient being conveniently seated, the surgeon is to open the mouth very wide, and depress the tongue with any flat instrument, which is afterwards to be committed to the care of an assistant. The operator is then to take hold of the diseased tonsil with a tenaculum, and with a common scalpel, having the back half of its blade covered with rag, he now removes as much of the tonsil, as ought to be taken away. In common cases, it is deemed sufficient to cut on a level with the pillars of the velum pendulum palati. If any other portion should require removal, this should next be performed. The operation being finished, the patient is frequently to wash his mouth with proper gargles.

The preceding plan seems a very simple and easy one, and was, for a long while adopted by Desault. It is said, however, to be liable to one objection, which is, that, when the end of the knife is conveyed far into the mouth, it may do mischief, not (as has been alleged) to the internal carotid artery, the backward situation of which completely keeps it out of all danger of being wounded, but to the membranous covering of the palate, in a place not corresponding to the tonsils. Desault thought this objection was the more forcible, as when the hook is introduced into the tonsil, the danger of the above mischief is considerably increased by a general spasm, which seems to affect every part of the mouth. Hence, this eminent surgeon used to employ, for cutting away diseased tonsils, an instrument, which was first invented for dividing cysts of the bladder. The contrivance consisted of a sharp-edged blade, which was included in a silver sheath. The latter had at its extremity a kind of notch, in which the gland, which was to be extirpated, was received. The rest of the instruments were similar to those used in the operation above described. Desault used to proceed, as follows:

1. The patient being seated on a high chair, with his head supported on an assistant's breast, the surgeon is to make him open his mouth very wide, and the lower jaw is to be kept thus depressed, by any solid body placed between the teeth, and held there by an assistant.

2. The tongue is to be kept down with a broad spatula.

3. The surgeon is next to take hold of the tonsil with a double hook, with which he is to raise and draw it a little towards him. He is then to take the above cystitome, and put the tonsil in the notch, on a level with the place, where the incision is intended to be made.

4. When the portion, which is to be cut off, is engaged in the notch, the operator is to draw the part towards him, so as to stretch it, and press the instrument against it from below upward. The blade being next pushed across the notch, the necessary section is accomplished. When the division is not complete, which is particularly liable to happen, when the diseased gland is of considerable magnitude, the blade is to be drawn back, and the section completed by applying the instrument to the wound, which it has already made. Even a third application may possibly become requisite on some occasions.

5. The patient is to be directed to wash his mouth. Bichat states, that this plan of operating, adopted by Desault, is equally simple and easy as the method above related, with the advantage of being safer. Such is the construction of the blade of the instrument, that when it slides across the notch, it presses against, and steadily fixes the parts, which are to be divided; an advantage which neither the knife nor scissars have, before the action of which the parts are quite moveable. Hence, there is difficulty in cutting them. When the introduction of the instrument from above downward, is difficult, it is better to withdraw it; and, after turning the notch in the opposite direction, pass it from below upward. In general, however, the first of these methods is preferable, because the gland, when half cut through, cannot now fall back and obstruct the rima glottidis, so as to bring on danger of a sudden suffocation; a circumstance which Wiseman and Moscati have seen happen. With a view of preventing this occurrence, M. Louis recommended the common scalpel to be used, with its edge directed upward, as has been advised for the above instrument; which latter contrivance however, being, according to Bichat's account, more easy and safe, merits the preference. Besides the advantage of fixing the soft parts, which are to be cut, it has that of not contusing them, like most other instruments of this nature, as, for instance, scissars. The oblique disposition of its blade makes it divide parts, in the manner of a saw.

The above contrivance, as Bichat allows, is certainly increasing the number of surgical instruments; a thing, which all the best modern surgeons endeavour to avoid. But, as this author remarks, this instrument is not exclusively applicable to any particular operation. It may be employed for cutting away the tonsils and uvula; dividing membranous fræna in the rectum, vagina, and bladder; amputating fungous excrescences, polypi of the nose, (if this mode of extirpating them were preferred) and various tumours in general, which are deeply situated in different cavities of the body, where instruments introduced unguardedly might injure parts which should be avoided, or where the base of the tumour should be steadily fixed, when its division is to be accomplished. The latter object cannot safely be effected by scissars. When the base of the tumour is too large to be received in the notch, one part is first to be divided, and then another, till its whole thickness is cut through.

The ligature, as a means of extirpating enlarged tonsils, is, in general, only proper for timid patients, who will not have the knife employed, or whose fears are such as would baffle the operation with a cutting instrument. Tying the tonsils is more tedious, and not at all less painful, than cutting them away, and always creates a vast deal more irritation. Moscati having once adopted this plan, very severe pain and inflammation ensued; the difficulty of swallowing and breathing compelled him to amputate the tumour at the place where the ligature was applied, and all the bad symptoms immediately ceased. Besides, when the ligature is used, the oozing of blood cannot take place from the ends of the cut vessels, and which tends so much to diminish the inflammation. The base of the swelling is also commonly broader than its upper part, and does not admit of being properly surrounded with a ligature. And, when it has a narrow base, it can then be so easily removed with a cutting instrument, or with Desault's instrument, and with so little pain, that one of the last modes is always preferable.

The ligature, however, has had its advocates. Heister recommends it, in certain cases; Sharp praises it; and others approve its use, and the plans of employing it have been as various as the inventive genius of the different partisans of the practice. Some make use of Levret's double cannula, which is furnished with a silver wire noose, in which the tumour is to be engaged. By twisting the instrument, the diseased part becomes constricted; and this plan being repeated every day, the circulation is intercepted, and the gland mortifies, and sloughs away. Some, after putting the noose of a ligature over a kind of tenaculum, hook hold of the tonsil, push the ligature over the enlarged gland, which they tie, without having any means of increasing the constriction every day. Some employ Belloque's instrument for putting the ligature over the tonsil. Others require no instrument whatever for the purpose, and accomplish the business with their fingers.

Passing over a more ample historical detail, we need only observe, that two inconveniences generally attend all the above plans. Some of them do not admit of the constriction being afterwards increased, and, therefore, are apt to prove insufficient. Indeed, this is usually the case; and it becomes necessary to apply another ligature. Others of the above methods, free from this objection, are attended with the inconvenience of leaving in the mouth too large a body, which is very annoying. The repeated twisting of the wire, also, sometimes makes it break, and renders another operation indispensable, which is much more painful than the first one.

In order to obviate these inconveniences, Desault employed an instrument, which the French call *un serre-nœud*, which is an exceedingly simple thing, being, in fact, nothing more than a long, narrow, round piece of silver, terminating at one end in a little ring, or hole, and, at the other, in a kind of groove or notch. Desault sometimes employed the same instrument for tying nasal polypi, and tumours in the vagina, and rectum.

The following was this celebrated surgeon's method of extirpating the tonsils with a ligature.

1. The patient is to be seated on a high chair, with his head held back, on an assistant's breast; his mouth is to be opened very wide, his tongue depressed, and the diseased tonsil taken hold of with a double hook.

2. The surgeon takes the *serre-nœud*, in which a ligature has been passed, so as to form a noose. The noose is to be put over the handle of the hook, which is to be committed to the charge of an assistant, and the noose then pushed over the tonsil, so as to embrace it completely.

3. The surgeon is now to draw the ligature strongly towards him, and push forward the *serre-nœud*, so as to produce the requisite constriction of the tumour. In general, the ligature should not be made very tight the first day.

4. When the constriction is such as it ought to be, the double-hook is to be withdrawn, and the ligature twisted round the notch, at the outward end of the instrument.

5. The next day, the gland becomes unusually large, in consequence of the impediment to the return of the venous blood. The ligature is to be unfastened from the notched end of the instrument, and drawn more out, so as to increase the constriction. When this is sufficient, the ligature is to be again twisted round the notch. This plan is to be followed up, till the tumour is detached, which usually happens on the fourth or fifth day.

The method now described is more simple, than those recommended by Paré, Fabricius Hildanus, Scultetus, &c. but, as Bichat and Desault advise, the knife, if possible, should always be preferred to the ligature. (*Desault par Bichat, Tom.* 2.)

I shall conclude this article with observing, that the best modern practitioners in this country prefer a common knife to any other instrument, for the performance of this operation.

**TOPHUS.** (said to be derived from a Hebrew word.) A swelling, which particularly affects a bone, or the periosteum. See *Node.*

**TORTICO'LLIS.** (from *torqueo*, to twist; and *collum*, the neck.) The wry-neck. See *Wry-neck.*

**TOURNIQUET.** (*French*, from *tourner*, to turn.) An instrument used for stopping the flow of blood into a limb, until some requisite operation has been performed, or some more permanent plans of checking hemorrhage have been put in practice.

The old surgeons used to surround the limb with a band, with which they made such a degree of constriction, that the circulation was quite stopped. These practitioners also believed, that the pressure of the band was advantageous, by benumbing the limb, and moderating the pain of operations.

The violent pain and contusion, however, which this tourniquet occasioned, being frequently followed by mortification and abscesses, surgeons endeavoured to devise some other method of checking hemorrhage. The application of the circular band was first improved, so that it caused less pain, and less mischief to the skin. The limb was surrounded with a very thick compress, over which the band was placed. Two small sticks were next put under the band; one on the inside, the other on the outside of the limb; and they were twisted till the band was rendered sufficiently tight. It is in this manner, says Dionis, in his *Traité d'Opérations*, that carriers tighten the cords which fasten the bales of goods in their carts. A

French surgeon, named Morel, is said to have made this first improvement in the application of tourniquets.

M. Petit, in 1718, presented to the Academy of Sciences a tourniquet of his own invention, which was much more perfect, than any previously contrived. It consists of two pieces of wood, one of which is superior, the other inferior. The inferior piece is about four inches and a half long, and nearly two broad. Its under surface is somewhat concave, while its upper one is a little convex, and the ends are hollowed out. From its middle part rises a round eminence, about seven lines high, and eight and a half broad. The superior piece is almost the same as the inferior one, just described, but rather shorter. The eminence, which ascends from its middle part, is six lines high, and an inch and a half in diameter. This eminence is hollow within, and calculated to receive a wooden screw, the top of which is a sort of button for turning the screw. The grooves of Petit's screw were about four, or five, and each of them four lines in diameter, in order that a half turn might produce the necessary effect. Lastly, all the pieces of the instrument were fastened together by an iron pin, which went through the middle of the two pieces of wood, and through the whole length of the screw. This iron pin was rivetted under the inferior piece, and at the top of the button, in such a manner, however, that the screw was capable of turning on it, as on a pivot.

In order to apply this tourniquet, the limb is to be surrounded with a double strap, about four finger-breadths wide, and made of chamois leather, which is the softest material which can be used. To one end of the strap a double little cushion is fastened, of the same length and breadth as the lower piece of the tourniquet. A narrow compress, or cylindrical pad, is also requisite, for the purpose of compressing the track of the vessels. This compress consists of a very firm roll of linen, covered with chamois leather. The ends of a piece of tape are sewed to the outer part of the pad, and thus the tape leaves a passage for the leather strap. By this artifice, the pad can be moved to any situation on the strap, which is most convenient, according as the bulk of the limb may require. The middle of the tape is to be fastened to the outside of the leather strap. The cylindrical compress, or pad, is to be put over the course of the vessels. The double cushion is to be placed on the opposite side of the member, while the leather strap is to surround the limb in a circular manner. All the different pieces of the apparatus are next to be retained by the tape, which is to be tied at the side of the cushion.

The tourniquet is now to be put over the cushion, on that side of the limb which is furthest from the track of the large vessels, and is to be fastened in this situation by a double band, with a hole in it for the reception of the upper part of the screw.

In order to make the proper compression, the screw is to be half turned round, from the right to the left. The upper piece of the tourniquet becoming now further from the lower one, the double band draws the pad, and presses it against the vessels, so as to make the due degree of compression.

The following are the advantages, attending the use of Petit's tourniquet: 1. It compresses the lateral parts of the limb less, than the tourniquet previously in use. 2. It requires the aid of no assistant, either to hold, tighten, or loosen it. 3. The operator is able of himself to stop the flow of blood in the artery, by means of the screw. 4. When there is any danger of hemorrhage after an operation, this kind of tourniquet may be left on the limb, and, in case of the bleeding coming on, the patient, if no one be at hand, can tighten the instrument himself, as much as is necessary. 5. The constriction, which this tourniquet produces, does not create any danger of mortification, because it does not altogether stop the flow of blood through the collateral arteries.

The tourniquet just described is certainly very complex, when compared with that which is used by the best modern practitioners; but, still it is the original of the latter, and both are constructed on the same principles. All the pieces of modern tourniquets are kept connected together, and instead of two pieces of wood, used by Petit, there is contrived a brass bridge, which is capable of being elevated, or depressed, by means of a screw, made of the same metal. Over this bridge a very strong band proceeds, and by passing under two little rollers, at each end of the bridge, it always remains connected with the instrument. A convex firm pad is sewed to the band, and put immediately over the artery, where the instrument is applied. There are no cushions for the opposite side of the limb under the screw; but a thick piece of leather, through which the band proceeds in two places, is always situated under the lower surface of the brass, and serves to prevent any bad effects of its pressure. It is usual also for the surgeon to fold some rag, and to put it in this situation, at the time of applying the instrument. (See some other remarks on the tourniquet, in the article *Hemorrhage.*)

TRACHEA, Wounds of. See *Throat.*

TRACHEOTOMY. (from τραχεια, the windpipe, and τεμνω, to cut.) The operation of cutting an opening into the windpipe for various surgical purposes. See *Bronchotomy.*

**TREPAN.** (from τρυπαω, to perforate.) *Trepanum*; *Terebellum*; *Modiolus.* A circular saw, by means of which the skull is perforated in the operation called *trepanning.* It bears a considerable resemblance to the well known instrument named a wimble, and is worked in the same manner. Formerly, the saw was sometimes made of a conical shape; (see *Abaptiston*) but this construction rendered the action of the instrument difficult, and as the fear of a cylindrical saw penetrating too suddenly, so as to injure the brain, was found by experience to be an insufficient reason for the conical shape of the saw, the cylindrical trepan at length came into general use. In this country, the trepan is now superseded by the instrument, called a *trephine*, which has a different kind of handle from that of the trepan, and is not worked in the same way. On the continent, however, the trepan still has the preference.

**TREPHINE.** The instrument now commonly preferred for perforating the cranium, for purposes which we shall presently explain. It consists of a simple cylindrical saw, with a handle placed transversely, like that of a gimblet; and, from the centre of the circle, which the teeth of the saw describe, a sharp little perforator projects, named the centre-pin. The upper part of the centre-pin is made to screw in a corresponding hole at the inside of the top of the saw, and is capable of being taken out, or put in, at the surgeon's option, by means of a little key for the purpose. Its use is to fix the trephine, when it is first applied, that is, before the teeth of the instrument have made a sufficient circular groove, in which they can steadily work. When this has been accomplished, the centre-pin must always be removed; because now it is not only not needed, but, if left, it would retard the progress of the operation, and inevitably wound the dura mater and brain, when the teeth of the saw had cut to a certain depth through the cranium. My trephines, which I bought of M. Savigny, have their centre-pins contrived to slide up, or down, and to be fixed in either position by turning a little screw. This method seems to me both ingenious and convenient.

The cylindrical part of the trephine is often termed the *crown* of the instrument. The surgeon should have at least two, or three cylindrical saws of various sizes; for, it is always a commendable rule, never to saw away any more of the cranium, than is absolutely requisite for the accomplishment of some assignable object. There is no occasion, however, for having any more than one handle, which may be made to screw on any of the saws.

Trephines are also occasionally applied to other bones, besides those of the cranium. In the articles *Antrum, Caries, Exostosis, Fractures of the Sternum, Necrosis, Spina Ventosa,* other cases are mentioned, in which the employment of these instruments sometimes becomes proper.

It is certainly not always desirable to remove a complete circular portion of the cranium; the taking away a piece of smaller size, and of a different shape, would frequently be much more advantageous. Some surgeons, I understand, who object to removing any unnecessary quantity of the cranium, have been in the habit of employing a trephine, terminating only in a semi-circular, instead of a circular saw, by which means, they can often cut across the base of a depressed portion of the skull, and take it away, without any occasion for removing also a circular piece of bone. An instrument of the latter kind may certainly be sometimes found useful.

The saws, however, which Mr. Hey has described, should constantly be kept in every case of trephining instruments. This practical writer remarks, that "the purposes, for which any portion of the cranium is removed, are, to enable the surgeon to extract broken fragments of bone, to elevate what is depressed, and to afford a proper issue to blood or matter that is, or may be confined, &c.

"When a broken fragment of bone is driven beneath the sound contiguous part of the cranium, it frequently happens, that the extraction cannot be executed without removing some of the unbroken part, under which the fragment is depressed. This might generally be effected with very little loss of sound bone, if a narrow portion of that, which lies over the broken fragment, could be removed. But such a portion cannot be removed by the trephine. This instrument can only saw out a circular piece. And as, in executing this, the central pin of the saw must be placed upon the uninjured bone, it is evident, that a portion of the sound bone, greater than half the area of the trephine, must be removed at every operation. When the broken and depressed fragment is large, a repeated application of the trephine is often necessary, and a great destruction of sound bone must be the consequence.

"When the injury consists merely of a fissure with depression, a small enlargement of the fissure would enable the surgeon to introduce the point of the elevator, so as to raise the depressed bone. But a small enlargement of the fissure cannot be made with the trephine. When it is necessary to apply the elevator to different parts of the depressed bone, a great deal of the sound cranium must be removed, where a very narrow aperture would have been sufficient.

"The same reasoning will apply to the case of openings, made for the purpose of giving a discharge to extravasated blood, or matter.

"If a saw could be contrived, which might be worked with safety in a straight, or gently curvilineal direction, it would be a great acquisition to the practical surgeon. Such a saw I can now with confidence recommend, after a trial of twenty years, during which time, I have rarely used the trephine in fractures of the skull. Its use has been adopted by my colleagues at the General Infirmary in Leeds; and will be adopted, I hope, by every surgeon, who has once made trial of it." Mr. Hey next informs us, that the instrument was first shewn to him by Dr. Cockell, of Pontefract; but that there is a saw, formed on the same principle, in Scultetus's Armamentarium Chirurgicum. The saws alluded to are very short ones, fixed at the end of a longish straight handle; their edges are made either straight, or semicircular. The latter construction qualifies the instrument for cutting in a curvilineal direction, which is often proper. The edge of the saw should always be made a little thicker than the rest of the blade, by which means it will work in the groove, which is cut, with more facility.

Saws, made on the principle just described, are also of infinite use in cutting away diseased portions of other bones, besides the skull, exostoses, &c. In cases of necrosis, when a dead part of a bone is quite wedged in the substance of the surrounding new bony matter, Mr. Hey's saws may often be advantageously employed for cutting away the parts, which mechanically prevent the detachment of the dead piece.

Besides trephines of various sizes, and the saws just now noticed, the surgeon should also take care to have in his case of instruments for this operation, a little brush for occasionally cleansing away the particles of bone from the teeth of the saw, in the progress of the operation; a pair of forceps adapted for extracting the round piece of bone after it has been detached by the saw; a lenticular for removing any inequalities, which may present themselves, round the sawn edge of the cranium, after the circular piece is taken out; a raspatory for the same purpose, and, also, for scraping the bone in order to see whether it will bleed, which is a circumstance in some cases very important to be attended to; (See *Head, Injuries of;*) a largish common scalpel for dividing the scalp, &c.; and some elevators for raising depressed pieces of bone.

The common elevator is now generally used by all the best English surgeons; but several others have been proposed, as, for instance, the tripod elevator; and another one, invented by M. J. L. Petit, and afterwards improved by M. Louis.

Before beginning the description of the operation, I think it highly proper to remind the reader, of what has been so forcibly dwelt upon in the article *Head, Injuries of,*—that the removal of pressure off the brain, which pressure must also actually occasion dangerous symptoms, can form the only true and vindicable reason for employing the trephine, or sawing away any portion of the skull. There are very few exceptions to this remark: it may, indeed, be now and then proper to saw away the bony edges, which surround some fungous excrescences, which grow from the dura mater, and make their way outward, by occasioning an absorption of the part of the skull immediately over them. (See *Dura Mater.*) It may also be sometimes proper to saw out diseased portions of the skull, though, it must be confessed, that in general their separation should be left to time and nature.

In the records of surgery, innumerable facts may be consulted, where the prudent and judicious employment of the trepan has effected wonderful cures, and been the only thing by which the patients' lives could possibly have been saved. The benefit, which the operation brings about, is also sometimes so sudden and astonishing, that in no instance does the interposition of the surgical art display itself to greater advantage. The immediate restoration of sight by the depression, or extraction of an opaque substance from the eye, is not more beautiful and striking, than the instantaneous communication of the intellectual faculties, and of the powers of speech, of feeling, &c. together with voluntary motion, to a person lying in an apparently lifeless state from an injury of the head. The utility of the trepan is occasionally manifested even in this degree. In the valuable essay of Mr. Abernethy on injuries of the head, a case may be seen, in which the patient, who had been in a condition almost bereft of animation, rose up and spoke the instant the extravasated blood was removed from the surface of the brain. And amongst the wounded at the battle of Waterloo, there was a soldier of the 44th regiment, whose case is of equal interest. He had been struck with a musket-ball on the right parietal bone, which was exposed, and had no appearance of being fractured. As however the symptoms of compression were urgent, and the patient was in nearly a lifeless state, I conceived it right to apply the trephine to the part on which the violence had acted. I had not sawn long before the external table came away in the hollow of the trephine, leaving the inner table behind, which was not only splintered, but driven at one point more than half an inch into the membranes and substance of the brain. No sooner were the fragments taken out with a pair of forceps, than the man instantly sat up in his bed, looked round, and began to speak with the utmost rationality. It is a most extraordinary fact, that this patient got up and dressed himself the same day, without leave from the medical officers, and never had a bad symptom afterwards. Immediately the operation was finished, the temporal arteries were opened, and some purgative medicines exhibited.

Let not the young surgeon, however, draw from these dazzling cases of success an immoderate solicitude to perform the operation; for, it should never be undertaken but in the most pressing circumstances, and when the symptoms unequivocally shew, that a dangerous degree of pressure on the brain exists. I recollect an unfortunate example, in which the late Mr. Ramsden of St. Bartholomew's Hospital ventured to saw out a portion of the frontal bone, for a mere long continued pain in the part: the patient was attacked with inflammation of the dura mater, and perished in three or four days. We may therefore conclude, that the operation is not itself exempt from danger; and it is certain, that it ought never to be resolved on without deep consideration. "*Gravis tamen satis est operatio, ut nunquam, nisi indicationes sufficientes adsint, institui debet.*" (*Callisen Syst. Chir. Hodiern. Tom.* 1, *p.* 658.)

The trepan, or trephine, is never necessary in injuries of the head, except for the purpose of relieving the brain from pressure. Such pressure may be caused by a depressed portion of the cranium, or it may be produced by an extravasation of blood, or the lodgment of matter, betwixt the skull and the dura mater. The chief danger of concussion, when the accident is not directly or soon fatal from the disorganization and mischief done to the brain, depends upon the consequent inflammation of this organ, and therefore can be little likely to be benefited by the use of the trepan. If the operation becomes proper in such a case, it is when an abscess has formed under the cranium, and when the confined matter itself creates bad symptoms by its pressure on the brain. This state of things, however, cannot come on till after the inflammation of the brain and its membranes has prevailed a certain time, and it is always accompanied with a detachment of the pericranium and a puffy tumor of the scalp; or, if there be a wound of the latter part immediately over the abscess, the lips of the injury suddenly acquire an unfavourable appearance, and lose their vermilion color. The patient has also had much preceding febrile disorder, pain and tension over the whole head, redness and turgescence of the eyes, and generally more or less delirium. When the matter is forming, there are usually some rigors, and as soon as it is formed the patient falls into a comatose state, and paralytic symptoms shew themselves. Here the urgency for the prompt application of the trephine is very great, and the patient's chance of living is almost essentially connected with the immediate performance of the operation. This important case has been particularly dwelt upon in the writings of Mr. Pott.

In the articles, *Head, Injuries of; Extravasation; &c.* we have laid down the most remarkable symptoms of concussion, and compression of the brain, a subject, which every surgeon should study with earnest attention before he ever presumes to employ the trepan. For, sometimes these accidents are extremely difficult to be discriminated; sometimes they exist together in the same individual; a complication which is peculiarly embarrassing; and, in every instance, where the symptoms are those of concussion, the operation, so far from being indicated, would be a step of all others the most likely to do harm, by increasing the irritation and inflammation of the brain and its membranes. A fall upon the back, or upon the head, occasions a direct concussion of the brain, and the shock, not being materially weakened by the intervention of any yielding elastic structure, is the more dangerous. When a person has fallen from a certain height, and pitched on his head, his back, the buttocks, the knees, or even the soles of the feet; when he has been instantly deprived of his senses, and then by degrees recovered them and come to himself again; the fact of his having suffered concussion of the brain is clear and indisputable. Concussion has likewise taken place, though in a slighter degree, when the patient has been only stunned by the fall, and experienced a sensation of sparks. But, a multitude of degrees separate this feeble concussion from that in which the substance of the brain is instantaneously disorganized, so that the patient has not the possibility of recovery.

The symptoms of concussion of the brain are attended with coma, and the compression of this organ by an extravasation is also accompanied with lethargic heaviness. How then is the surgeon to ascertain, whether the comatose disorder arises from one or the other of these affections?

Here in order to avoid repetitions, I beg leave to refer to the observations already made in the articles quoted above. But there is one criterion of such first-rate importance, that it may prevent innumerable fatal mistakes, and, indeed, without the continual recollection of it, no man ought to be rash enough to interfere with this dark and abstruse part of surgery. On this account, I shall mention it here, notwithstanding we have already noticed it elsewhere. If the patient is knocked down and stunned directly by the blow, and remains in a state of insensibility, these primary symptoms are ascribable to the concussion. On the contrary, when the coma and loss of sense do not take place till an hour or two after the blow, they are to be imputed to an extravasation.

The shock given to the brain by concussion must, like every other impulse communicated, continue to diminish until it ceases altogether. If, at the very time of the blow, the shock has not been forcible enough to produce alarming symptoms, such symptoms will not afterwards come on when their cause is weakened. Hence, the reason may be discerned, why compression can be distinguished from concussion of the brain, when there has been an interval of sense between the receipt of the blow and the occurrence of the bad symptoms. But, the distinction of the symptoms into primary and consecutive cannot be made when concussion and extravasation exist together.

Having made these few remarks on concussion and compression of the brain, remarks, which seemed necessary before we entered into a description of the operation of the trepan, we shall next premise some observations relative to contusions and fractures of the skull, cases on which the most erroneous opinions have been entertained. It is true, that I have in another place (see *Head, Injuries of*) considered the subject; but, it may be better to recapitulate certain points here, because they have such immediate connexion with the application of the trephine.

Contusions of the head not unfrequently occasion a small kind of tumour, which is soft in the centre, but hard and resisting at the circumference, especially when the violence has been considerable. Now the ease, with which the centre or seat of the extravasated fluid admits of being depressed, while the circumference remains hard and elevated, is extremely apt to give rise to the belief, that a fracture with depression has happened. The true nature of this accident was first clearly explained by the eminent M. J. L. Petit, and since his time the proper cautions not to fall into a mistake concerning it, have been laid down by the generality of surgical writers.

Often nothing is more obscure, than the diagnosis of fractures of the cranium: their existence indeed can only be made out with certainty, when they can be felt, or seen. Thus a fracture of the skull, attended with a wound of the scalp, and exposure of the bone, shews itself in the form of a fissure more or less wide and extensive, and taking various directions. The accident may also be known by the touch even when the soft parts continue entire, particularly if the fracture is accompanied with splinters, or the edges of the fissure are materially separated. When there are many splinters, entirely detached, a crepitus will likewise serve to explain the nature of the accident; but, unassisted by these symptoms, imparted to him by the sight, the hearing, or the touch, the practitioner cannot at once offer a decided opinion as to whether a fracture exists, or not.

In order to procure more positive information, would it be right and judicious to make several incisions and uncover the bone? But, here the surgeon would be embarrassed in the very commencement of his proceedings; for, how would he be able to judge where the knife should be applied? Why also should he resort to an useless and painful operation, which (to say the best of it) could only render the patient's cure more distant?

The symptoms, indicating compression of the brain, can alone justify an examination of the fracture. These symptoms also must be urgent and alarming; for, when they prevail in a slight degree, bleeding and evacuations promise more benefit, than any operation on the skull, and consequently all examination of the part, supposed to be broken, must be unnecessary. The precept, too commonly given, to cut through the scalp for the purpose of bringing the fracture into view, will no longer be matter of surprise, when it is known, that with some surgeons, the operation of the trepan is a thing of course in all fractures of the cranium.

Even when the cranium has been denuded, so that the sight can convey due information respecting the solution of continuity in the bone, care must be taken not to be deceived by a suture, or by the groove of a vessel. In cases of doubt, a modern surgical author advises us to scrape the outside of the bone; and he tells us, that, if after the removal of the external table, the fissure yet appear, and a thread of blood be seen at its outer part, no doubt exists of its being a real fissure. As however making this examination can answer no purpose, except with a view to determining the place where the trepan should be applied, I cannot recommend the plan, except where the symptoms are such as to render this information desirable. On the contrary, it appears to me, that all examinations of the bone, made seemingly from mere curiosity, and without any true surgical object, should be deprecated as rash and hurtful.

The danger of fractures of the skull does not depend upon the simple solution of continuity: it bears altogether a relation to the concussion and compression of the brain, with which the injury of the bone may be complicated. The pressure, which is caused by depressed splinters of bone, is less alarming inasmuch as the cause of the compression is easy of removal. The pressure arising from extravasated fluid is far more serious, in consequence of the difficulty of ascertaining positively the existence and precise situation of such extravasation.

The seat of the extravasation is sometimes between the skull and the dura mater, which has been detached from the bone. More frequently, it occurs either between the dura mater and tunica arachnoides; in the substance of the brain; or else in the ventricles. The quantity of extravasated fluid is generally less in those extravasations, which are situated between the dura mater and the skull. The extravasations, which are formed in the substance of the brain itself, are not only more considerable, but also, as they mostly depend upon concussion, are more alarming, than effusions on the surface of the dura mater. It is indeed extremely difficult, if not impossible, to ascertain the situation of the extravasated fluid. In such cases, the trepan is likewise of no use; while concussion, when so violent as to produce internal extravasation, is invariably fatal. In extravasations between the dura mater and the skull, which are almost the only cases of the kind, to which surgery can administer relief, when the effused fluid lies under a part of the skull accessible to the trepan, the extravasated fluid is almost always small in quantity. The danger, however, is not the less: ten, or twelve drops of fluid are sometimes enough to produce a fatal compression. When the extravasation has happened in the substance of the brain, the compression is far more perilous: in short, it may be said to prove with very few exceptions certainly mortal. The danger is not so great, when the extravasation is situated between the skull and dura mater.

The lethargy, the degrees of which increase from mere drowsiness into the most perfect coma; and the paralysis of the opposite side of the body to the seat of the extravasation; are the characteristic symptoms of this accident in cases of injury of the head. Having explained elsewhere (See *Head, Injuries of; Extravasation*, &c.) some other symptoms, such as stertorous respiration, dilated pupils, &c. which usually indicate pressure on the brain, it is unnecessary here to dwell upon them. The subsequent increase of the coma, and paralytic affections, and the gradual augmentation of their intensity, serve to render these symptoms distinguishable from others, which are suddenly brought on by concussion. But there are instances, as every man of experience knows, in which concussion ruptures the blood-vessels, and produces an extravasation of blood. In this circumstance, it is obvious, that the symptoms of compression are blended with those of concussion. The symptoms proceeding from the latter cause always diminish in proportion to the time, which has elapsed from the moment of the injury; while those of compression succeed, and on the contrary, increase in intensity, in proportion as the quantity of extravasated fluid becomes more considerable. Notwithstanding these distinctions, however, it must be acknowledged, that there are many cases, in which the surgeon is obliged to remain in doubt with regard to the particular cause of the symptoms. This indecision is the more embarrassing, because the operation of the trepan is necessary in cases of extravasation, but useless in those of concussion. Even when extravasation is known to exist, the practitioner requires more information; for, he ought to know the precise situation of the effused fluid. It is true, indeed, that paralysis of one side of the body indicates the pressure to be upon the opposite hemisphere of the brain. But, what surgeon would venture to follow the practice advised by Van Swieten, and apply to the suspected side of the head three crowns of the trepan? Possibly, not one of them might fall on the situation of the extravasated fluid. When the skull is broken, the extravasation exists on the same side as the fracture. When it is the effect of concussion, or when the breach of continuity in the skull is what is termed, a counterfissure; the effusion is generally on the side of the head most remote from the blow. If the pressure is caused by a detachment of the internal table of the skull, the nature of the case cannot be ascertained before the operation of the trepan has been performed on the part of the skull, upon which the violence has acted. When there are two extravasations; one depending upon a fracture, and situated immediately under it, between the dura mater and the skull; the other arising from concussion, and situated at some point directly opposite, either between the dura mater and tunica arachnoides, or within the substance of the brain itself; paralysis may occur on the same side as the fracture, and hence, it may be inferred, that the palsy does not always take place on the side opposite to the extravasation. But, an examination of the body quickly proves, that the case does not deviate from the common rule. The extravasation, produced by concussion, being almost invariably more considerable, than that caused by a fracture, accounts for the extension of the palsy to the same side of the body. Sometimes, the side, which is not paralysed, is affected with convulsions; the pulse is full and hard; and the respiration stertorous; in short, the symptoms are analogous to those caused by apoplexy.

The evacuating plan, recommended for the treatment of concussion, (see *Concussion* and *Head, Injuries of*) is all that can be done, when every thing is uncertain relative to the situation of the extravasation, It is all that can be done in those frequent instances, where the effusion has taken place in the substance of the brain, so that it cannot possibly be voided. The trepan then is indicated only when there is an extravasation between the dura mater and the bone, the fracture being situated at a part of the skull accessible to instruments, and not at the base. We will not here dwell upon the doubtful example, where the fluid lies between the dura mater and the arachnoides. But, are the cases, which we have just been describing, as frequent as they are supposed to be? Cannot the effused blood be sometimes discharged through the interspaces of the broken pieces of bone? Is the trepan usually necessary for the relief of injuries of the head, as Quesnay, Pott, and the members of the French Academy of Surgery maintained? We think not—The operation is often useless, and sometimes dangerous. I believe that it should be limited to a small number of cases, in which not only the existence and situation of the pressure are known, but in which the symptoms, arising from this cause, are urgent and dangerous, and the pressure can be removed by no other means.

Richerand contends, that extravasations between the skull and the dura mater, so considerable as to produce compression of the brain, and render the trepan necessary, are much less common, than many surgeons think. Even when they do occur, the dura mater is always detached to a certain extent, and, according to this writer, if the bone is much broken, the interspaces of the fragments are quite sufficient for the evacuation of the effused blood. The following case is quoted in proof of this observation. A woman injured her head, by falling from a height of fifteen feet. The fracture reached the whole breadth of the skull, so that when the os frontis was taken hold of with one hand, and the os occipitis with the other, the two halves of the cranium admitted of being manifestly moved and separated. Blood issued from the fissure, the edges of which were kept apart by a small wedge of wood in such a manner that the pulsations of the brain were visible. On the sixth day, as nothing was discharged from the fissure, the bit of wood was removed, and on the fifty-second the wound had completely healed without any exfoliations. On the seventy-second, the patient was discharged from the Hôtel-Dieu perfectly cured. (*Nosographie Chirurgicale, Tom. 2, p. 292, Edit. 3.*)

Thus we see, that the trepan is often unnecessary in injuries of the head with fracture of the skull, notwithstanding the coexistence of an extravasation between the bone and the dura mater. This doctrine is very different from what is taught in the memoirs of M. Quesnay in the first volume of those of the French Academy of Surgery. Desault in the last years of his practice abandoned the operation of the trepan altogether. It has been remarked for many years, that, in the Hôtel Dieu, this operation has had very little success; a circumstance, which has excited a suspicion, that the foul air of the wards of that establishment might have had a share in bringing on the unfavourable event. We shall not here expatiate on the bad effect of the atmospheric air on the membranes of the brain; a thing, of which B. Bell seems to have convinced M. Richerand.

When the skull is fractured by a blow, or fall, and the case is a simple fissure, the trepan ought to be applied upon the solution of continuity, *if the symptoms indicate a dangerous degree of pressure on the brain*, and the edges of the fracture are not sufficiently separated to let the extravasated fluid escape.

When the detached portions of bone are depressed, so as to compress the brain, the operation is still requisite, if they cannot be elevated by other means. But Richerand maintains, that a positive indication for trepanning is not frequent, either because it is difficult to judge of the existence and situation of extravasations, or because extravasated fluids readily escape through the interspaces of the fragments, when there is a splintered fracture. Such facility is also increased, when one of the portions of broken bone is totally detached, so that it can be removed, leaving an aperture equivalent to what would be produced by the application of the trepan.

When the operation is determined on, it is more convenient to have the head shaved: indeed, this is often done immediately the surgeon is called, in order that he may have a better opportunity of seeing what parts of the scalp have been struck; for, it is in such situations, that he has most reason to apprehend fractures of the bone, or extravasations beneath it. If, however, the violence has occasioned a large wound, or laceration of the scalp, the practitioner, knowing where the force has been applied, is frequently content with having a little of the hair shaved off the parts surrounding the injury. All that need be said on this subject is, that it is always better to have enough of the hair taken away, to afford the surgeon an uninterrupted opportunity of examining the scalp freely, and doing whatever may be necessary. The loss of a little hair is of very little consequence, while the concealment of the seat of a depressed fracture, or extravasation, might lead to fatal consequences.

When the propriety and necessity of trephining are fully indicated, provided the wound, or laceration of the scalp, should not have exposed a sufficient surface of the bone for the application of the crown of the trephine, an adequate dilatation of such wound ought immediately to be made. If, in the situation of the blow, there should only be a contusion, or a lump, unattended with any wound, a division of this part of the scalp is to be made by carrying the knife quite down to the bone. In those cases, in which the swelling, occasioned by the violence, is considerable, and attended with the sensation of a crepitus; as well as in other instances, in which there is only a contusion, under which a fracture and displaced pieces of bone may be felt; the scalp must be divided in the same manner, only with greater caution, lest the point of the knife should insinuate itself through the fracture, and do mischief to the dura mater and brain.

Authors recommend the shape of the incision to be different according to the kind of fracture, and the parts of the head, on which the violence has operated. When the whole extent of the injury can be brought into view, by means of an incision, having the form of a letter T, the surgeon should be content with such a division; but, if this be not sufficient, he may give it a crucial shape. When the trephine is to be applied to the squamous part of the temporal bone, we are recommended to make the incision, as much as possible, in the shape of the letter V, the branches of which are to be upward, and the angle downward, in order that as little as possible of the temporal muscle may be cut, and that the division of its fibres may be avoided as far as it is in our power.

Having divided the scalp, the next object is to reflect it; but, no man would be warranted in cutting any part of it away, although such practice is advised by Pott, and many other eminent writers. The purposes of the operation do not require any removal of this kind; and the method would leave a wound, which would be long in healing, and, when healed, never exempt from deformity. In short, the reflected flaps of the scalp are capable of adhering to the parts, on which they are laid, after the operation, and, consequently, ought never to be wantonly cut away.

The scalp being reflected, authors next advise us to scrape away the pericranium, either with the knife, or the raspatory. Perhaps, this measure may be considered as one, which does neither much harm, nor much good. The design is to facilitate the application of the trephine to the bone. However, the teeth of a proper instrument, in good order, will not be impeded by the slender periosteum; and scraping this membrane away from parts of the skull, which are not to be removed, must be conducive to exfoliations.

Sometimes, the bleeding from branches of the temporal, or occipital artery, is so copious, that the bone cannot be very conveniently perforated before the hemorrhage is suppressed. If it be prudent to wait a little, and the case (as it generally does) should be likely to be benefited by the evacuation of blood, it is as well to let the bleeding continue for a certain time. The surgeon may then just direct an assistant to put the end of one of his fingers on the mouth of the vessel, and proceed in the operation. In some cases the bleeding might be so troublesome, that it would be better to tie the artery at once.

All parts of the cranium do not admit of being trephined with equal convenience and safety. It has usually been set down by surgical authors, that the trephine cannot be applied below the transverse ridge of the os occipitis. There are some cases, however, which prove that such an operation may be safely done, and that we ought not, in urgent circumstances, to be afraid of dividing the trapezius and complexus muscles, in order to be enabled to apply the trephine to the bone. (See *Hutchinson's Case in Medico-Chirurgical Transactions, Vol.* 2, *p.* 104, *&c.*)

The majority of writers also forbid us applying the trephine to the frontal sinuses, in consequence of the indeterminate depth of these cavities, and the apprehension of incurable fistulæ. M. Larrey, however, has deviated from this precept in two instances, and his practice confirms the statement of Mr. C. Bell, that by opening the frontal sinus with a large trephine and then using a small one, the internal parietes of this cavity may be trephined with perfect safety, and no risk of injuring the dura mater with the saw. (See *Larrey's Mém. de Chirurgie Militaire, Tom.* 2. *p.* 136—138.)

Writers also caution us not to apply the trephine to the anterior inferior angle of the parietal bone, in consequence of the middle artery of the dura mater lying under it, generally in a groove of the bone, and occasionally in a canal in its very substance. In the latter circumstance, this portion of the parietal bone could not possibly be taken away, without wounding the vessel. However, notwithstanding this advice, which has been unthinkingly handed down by one writer to another, from generation to generation, I very much question the soundness of the doctrine. We undoubtedly ought to avoid trephining this part of the cranium, when we can prudently do so. But the causes demanding this operation are always so urgent, that the patient's sole chance of existence depends on their quick removal. Hence, were there pressure on the brain, either from a depressed portion of bone, from blood, or matter, and such pressure could not be removed without trephining the anterior inferior angle of the parietal bone, what operator would be afraid of doing so? Besides, the fear of the hemorrhage has been very unfounded; for, the lodgment of the artery in a bony furrow, or canal, which authors have pointed out, as rendering the suppression of the hemorrhage more difficult, is a mere visionary idea, as it is well known, that a little plug of lint, pushed into the orifice of a vessel, so situated, will always stop the bleeding, with as much certainty and ease as can possibly be imagined.

The foregoing suggestion was made in the early editions of my works, and I now see the safety of the practice has been confirmed. "I have also applied the trepan (says M. Larrey) over the track of the spheno-spinous artery, at the inferior anterior angle of the parietal bone. The artery was divided; but, I stopped the hemorrhage almost immediately, by applying an iron probe red hot." (*Mém. de Chirurgie Militaire, Tom.* 2, *p.* 138.)

Writers, until very lately, also prohibited us from trephining over any of the sutures, and, especially, over the sagittal suture, beneath which the longitudinal sinus is situated. The fear of the dura mater being injured, and of this vessel being wounded, was the reason for the advice. With regard to the sutures in general, the trephine may be applied to them, as well as to any other part; and, as for the sagittal suture, many facts confirm the propriety of not being deterred even by it, though situated immediately over the longitudinal sinus. It is to be remembered, also, that the dura mater, in cases of extravasated blood, and matter, beneath the cranium, is detached by the intervention of such fluids from the inner table.

By means of a perforation practised over the sagittal suture, Garengeot successfully elevated a portion of bone, which pressed upon the longitudinal sinus, and made the patient quite comatose. The depressed piece of the cranium could not have been so advantageously raised, had the trepan been applied in any other situation. But a still stronger argument, in favour of this practice, when the case at all requires it, is the fact, that wounds of the longitudinal sinus, and the hemorrhage resulting from them, are not attended with any serious danger. Sharp mentions his having twice seen a bleeding of this kind. Another instance is also recorded in Warner's Cases. A child received a wound on its forehead: the two parietal bones were fractured, and a portion of each was depressed on the dura mater. The child lived a month, without any operation being done; but, at the end of this time, Warner applied the trepan. He found a splinter of bone sticking in such a way into the longitudinal sinus, that it could not easily be got out; consequently, he enlarged with a lancet the opening, in which the splinter was entangled. The hemorrhage, which was copious, was easily suppressed by the application of a little dry lint, and the child was relieved, though it died at the end of two months, after suffering a variety of symptoms, which had no connexion with the wound of the sinus, the opening of which soon healed. The fourth case, related by Marchettis, also confirms, that wounds of the longitudinal sinus are not fatal. Pott and Callisen have since recorded other facts, tending to the same conclusion. (See *Syst. Chir. Hodiernæ, Pars* 1, *p.* 659. *Edit.* 1798.)

Whenever a depressed fracture can be elevated to its proper level, without applying the trephine, and with the mere aid of a pair of forceps, or an elevator, trephining should never be performed, unless there be strong reason to apprehend, that blood, or matter, lodged on the surface of the dura mater, contributes to the occurrence of the bad symptoms, and ought to be discharged.

The scalp having been divided, if necessary, and the pericranium scraped from the surface of the bone, according to the common precepts, and practice, the next thing is the application of the crown of the trephine.

The surgeon is first to make a little impression with the point of the centre-pin, for the purpose of shewing the place, where it will work, when the crown of the trephine is applied in the proper situation; for, where such impression is made, the operator must make a small hole with a perforator, in order to fix the point of the centre-pin, on which the crown of the instrument turns backward and forward, as on an axis, during the first stage of the operation. Mr. Savigny's centre-pins make a perforation, without need of any particular instrument for the purpose, and, in this respect, are advantageous.

The point of the centre-pin having

been fixed, the trephine is to be turned, by regular semicircular motions, alternately to the right and left, which object is effected by steady pronations and supinations of the operator's hand. The teeth of the saw having made a tolerable circular groove, in which they can steadily work, the centre-pin becomes useless, and, as it would, if not withdrawn, or removed, certainly injure the dura mater and brain, by reason of its projecting further, than any other part of the instrument, it would be an unpardonable blunder to let it remain, after a proper circular groove has been formed by the teeth of the saw.

The beginning of the sawing may be executed boldly and quickly; for, the operator runs no hazard of doing mischief. It is necessary occasionally, with a view of facilitating the action of the instrument, to clean away the particles of bony matter, with a little brush, usually kept for the purpose in every box of trephining instruments. Were this plan neglected, the action of the cylindrical saw would be very much clogged.

The operator, however, must increase his caution, when the sawing has made greater progress; for, were he to be too bold, he might sometimes lacerate the membranes of the brain with the teeth of the instrument, particularly, as the thickness of the cranium is subject to infinite variety, both in different parts of the same head, and in different subjects. Let the surgeon, therefore, never forget to examine frequently with the point of a quill, whether any part of the circular groove is cut through or nearly so; for, when this is the case, the instrument must only be worked in such a way, as to make pressure upon, and cut, the part of the circle, which yet remains to be divided. In some few cases, it is said, that the surgeon can distinctly feel, when the teeth of the saw reach the diploe, or medullary structure, between the two tables of the cranium, and some writers have rashly directed us to saw with boldness, till the sensation of this occurrence is communicated to our hand and fingers. However, I believe, this possibility of discriminating the arrival of the teeth of the saw at the diploe is so uncommon, and so fallacious, that it should never be expected, or relied on. Nor ought the surgeon to saw with incautious force and rapidity, till he sees the teeth of the trephine bloody, which has been set down as another criterion of their having reached the diploe. I have already stated, that a great many skulls have hardly any space between several parts of the two tables. This is particularly often the case in old persons.

A prudent man will always prefer exerting a little force for the purpose of breaking some of the bony connexion, retaining the circular piece of bone, to running any hazard of injuring the dura mater, by sawing too deeply. After a certain time, therefore, it is better to lay down the trephine, and endeavour to elevate the portion of bone, with the aid of a pair of forceps, constructed for the purpose, and kept in most cases of trephining instruments, or else by means of an elevator, which is still more calculated for the purpose.

When the circular piece of bone has been taken out, and the edges of the perforation are unequal, and splintered, the irregularities are to be cut off with the lenticular knife. When there is extravasated blood underneath the opening which has been made, it sometimes spontaneously makes its escape, and, if it should not do so, the surgeon must remove it himself. If one perforation of the skull should not suffice for letting out the blood, as much more of the cranium ought to be removed with the trephine, as circumstances may require; there being no comparison between the danger of repeating the application of the instrument, and that of leaving a quantity of undischarged, compressing fluid, on the surface of the brain. Certainly, many facts on record evince, that the dura mater may be very extensively uncovered, without dangerous consequences. Sarrau saw a whole parietal bone exfoliate, in consequence of a blow on the head. Blegny relates a similar case; and Saviard makes mention of a woman, who had lost the upper part of the os frontis, both the parietal bones, and a large portion of the os occipitis, all of which had come away at the same time. The woman, notwithstanding, recovered. Vaugion, however, who also seems to relate this identical case, describes the exfoliation as not being quite so extensive.

I am of opinion, notwithstanding these facts, that exposing a large part of the dura mater with the trephine is, by no means, an operation exempt from serious danger. And, what I conceive confirms this statement, is my having known instances, in which persons, who had been rashly advised to submit to being trephined, for the cure of violent pains in the head, &c. died, in consequence of the operation.

However, I perfectly coincide with writers, who recommend the removal of as much bone, as is requisite, in order to be able to remove the whole of the pressure from the surface of the dura mater.

The application of the trephine, in cases of large extravasations, must in particular be made several times, when the situation of the fluid does not favour its escape. However, in this circumstance, Sabatier says, that we should not make numerous perforations all along the extent of the extravasation; but, only a counter-opening, as is done on the soft parts. This author expresses his surprise at there not being on record many examples of counter-openings made on the cranium, since analogy demonstrates their utility. I cannot help remarking on this part of the subject, that one very obvious objection to making openings of this kind in the cranium, is the impossibility of knowing with certainty, whether blood lies under any particular part of the skull; whereas, in abscesses of the soft parts, the surgeon feels the fluctuation of the matter, and knows, that his counter-opening will be made in the cavity containing it. One might also have occasion to make more than one perforation, in order to discharge blood extravasated beneath the skull, when the blow has happened near a suture, to which the dura mater continues adherent; for, it might happen, that an opening made only on one side of the suture, would only give vent to a part of the extravasation.

If we should not find blood lodged under the cranium; but the dura mater should seem elevated, tense, dark-coloured, forming a prominent fluctuating tumour, outward, it may be cautiously opened with a lancet, or bistoury, with a view of letting out any collection of blood underneath. In the article *Head, Injuries of,* we have stated the result of Mr. Abernethy's experience, in regard to the operation of opening the dura mater. This gentleman found, that the method never effectually discharged all the blood, but only the serous part of it. The evacuation of any of the compressing fluid must, however, be desirable; and, if the surgeon cannot do more, yet he has fulfilled his professional duty.

The utility of trephining is not limited to discharging extravasated blood, or matter, lodged underneath the skull. This operation frequently enables us to elevate depressed portions of bone. The latter object can often be accomplished by merely making one perforation. Sometimes, several perforations are requisite to be made near each other. Authors even state, that it may also become necessary to remove the intervening portions of bone with a pair of cutting forceps. The depressed part may then be easily raised by means of an elevator. Occasionally, indeed, I may say, very often, the best practice is to remove the depressed portion entirely, when its total separation from the rest of the skull can be accomplished by cutting across the base of the depressed piece. If any splinter stick in the dura mater, and should not admit of being withdrawn, without enlarging the wound in the membrane, the surgeon ought not to be afraid of doing this with a sharp instrument.

According to some quick-inferring writers, if, after dividing the dura mater, the surface of the brain appears smooth and flabby, with a fluctuation, we may conclude there is an abscess in its substance; and these authors, more enterprising with their pens, it is to be hoped, than with their scalpels, sanction the method of carrying the point of the bistoury to the depth of an inch, *if circumstances render so deep a puncture necessary.* "But," says Richerand, "prudence forbids us to go further. Cutting the surface of the brain causes no pain, and it produces less danger, than one might apprehend; but, experience and observation have proved, that the essential parts of this organ are situated near its base, and that *its surface may be removed without danger, or pain.*" (*Nosogr. Chir. T.* 2, *p.* 301, *Edit.* 3.)

After the operation of trephining, the divided scalp is to be placed as nearly as possible in its natural situation, and lightly dressed with a simple pledget of any common unirritating ointment. In applying the dressings, the surgeon should invariably keep in view these objects; namely, to let whatever is put on the wound be as light as possibe, not apt to make pressure on the brain, and of a nature, which cannot excite irritation. All stimulants are to be strictly avoided; nor will any bandage be better, than an ordinary night-cap of sufficient size to be put on with facility. It may be secured with bits of tape, which are to be tied under the jaw.

The practitioner should not now conceive, that he has done all that he ought to do. Let him remember the urgent necessity of keeping off, or diminishing, the inflammation of the dura mater and brain, which is to be feared. Let him bleed the patient largely and repeatedly; exhibit saline purges, glysters, and antimonials; and if the symptoms continue, let him apply a blister to some part of the head. I shall avoid, however, any repetitions on this subject, by referring to *Head, Injuries of.*

The aperture in the skull usually becomes closed with soft granulations, which slowly acquire a hard consistence. These almost constantly grow from the edge of the perforation, and seldom from the surface of the dura mater. While the cicatrix is soft, it should be protected from external injury with a thin piece of horn, or metal. Exfoliations from the margin of the perforation sometimes retard the healing of the wound; but, now that the practice of dressing with drying spirituous applications has been exploded, and the removal of any part of the scalp is condemned by all the best surgeons, these unpleasant consequences are rendered much less frequent, than in former days.

The reader may find an account of the operation of trepanning, or trephining, in every system of surgery; but, he should particularly consult the writings of Sharp, Le Dran, Dionis, Bertrandi, Pott, Sabatier, Abernethy, Desault, Callisen, Richerand, &c. Several parts of the Mémoires de l'Acad. de Chirurgie are also highly deserving of perusal.

**TRICHIASIS,** (derived from ϑριξ, the hair) sometimes also named *entropeon*, denotes a faulty inclination of the eyelashes inwards against the globe of the eye. According to Scarpa, the disease presents itself under two distinct forms: the first is, where the cilia are turned inwards, without the natural position and direction of the tarsus being at all changed; the second consists in a morbid inclination of the tarsus, and consequently of the eyelash towards the ball of the eye.

The first form of this disease is very rare, nor has it come under the observation of the experienced Scarpa more than once, and, in this instance, only some of the hairs had changed their direction. The second species, or form of trichiasis, or that which consists in a folding inwards of the tarsus and cilia at the same time, is that which is commonly met with in practice. It may be either complete, affecting the whole of the tarsus; or incomplete, occupying only a certain portion of the edge of the eyelid, and most frequently near the external angle of the eye. Sometimes, the disease is confined to one eyelid; at other times, it affects both; and occasionally the patient is afflicted with it in both eyes.

To these two species of trichiasis some writers have added a third, which they call *distichiasis*, and which they suppose to be produced by a double and unusual row of hairs. But, this third species, as Scarpa observes, is only imaginary, and the reason of such subdivision seems to have arisen from not recollecting, what was long ago remarked by Winslow and Albinus, that although the roots of the cilia appear to be disposed in one line only, they nevertheless form two, three, and in the upper eyelid even four rows of hairs, unequally situated, and as it were confused. Whenever, therefore, in consequence of disease, a certain number of hairs are separated from each other in a contrary direction and disorderly manner, the eyelash will appear to be composed of a new and unusual row of them, while, in fact, there has been no change, either with respect to their number, or natural implantation.

It is not an easy matter to determine precisely, says Scarpa, what are the causes, which sometimes make a few of the hairs deviate from their natural direction, while the tarsus continues in its right position. They are commonly referred to cicatrices in consequence of previous ulceration, whereby the cilia fall off, and those which are growing are hindered from taking their proper direction. There must, however, be other causes sometimes concerned; for, in the case seen by Professor Scarpa, two or three hairs were turned inwards against the eyeball, although there had been no preceding ulceration, nor cicatrices, of any part of the tarsus. Indeed, Scarpa is inclined to believe, that the small ulcers and scars, which are sometimes formed upon the internal margin of the tarsus, are more likely to cause the second form of the disease, or the inversion of the edge of the eyelid, and, consequently, of the cilia towards the globe of the eye. As these ulcers, when neglected, destroy the internal membrane of the eyelids near the tarsus, it necessarily follows, that, in proportion as they heal and diminish, they draw along with them and turn inwards the tarsus, and hairs inserted into it. And since these little ulcerations do not always occupy the whole extent of the internal margin of the eyelid, but are sometimes confined to a few lines, in the middle, or extremity, near the external angle of the eyelid, so after the cicatrices are formed, the whole of the hairs are not invariably turned inwards, but only a certain number of them, which correspond to the extent of the ulcers previously situated along the internal edge of the tarsus. Indeed, in every case of imperfect trichiasis from a cicatrix of the inner margin of the eyelid, the tarsus and cilia are every where in their natural situation, except opposite the part, where the ulcers formerly existed. Also, if the eyelid be everted, its internal membrane, near that part of the margin corresponding to the seat of the trichiasis, will be found pale, rigid and hardened, the inversion of its cartilaginous border and of the cilia being plainly a consequence of the contraction of the cicatrized point.

Besides these causes, there are others, which may produce the complaint. Chronic ophthalmies of long continuance sometimes have this injurious effect, in consequence of the skin of the eyelids being kept for a long time in a state of distention and œdema, terminating in a relaxation of them. The cartilaginous margin of the eyelid then loses the proper support of the integuments, inclines towards the eyeball, and afterwards turns inwards, drawing the eyelashes along with it in the same improper direction. Long-continued puriform discharges from the ciliary glands likewise spoil the shape and consistence of the cartilage of the eyelid, and therefore not unfrequently occasion trichiasis. Scarpa doubts, whether a spasmodic contraction of the orbicularis palpebrarum muscle can ever be a cause of the disease, notwithstanding what Mr. B. Bell has asserted upon the subject.

The annoyance, which must necessarily result from the hairs perpetually pressing upon the cornea and white of the eye may be easily imagined even by those, who have little acquaintance with surgery. The evil is rendered still greater by the hairs, which are turned inwards, becoming much longer and thicker, than those which retain their natural direction. And although the trichiasis be confined to one eye, both the eyes usually suffer from the effects of the disease. Indeed, generally, the eye on the sound side cannot be moved without occasioning pain in that, which is exposed to the irritation and friction of the inflected hairs. In almost all instances, both the eyes are very irritable, and incapable of bearing the light. As, in cases of incomplete trichiasis, the patient retains some little power of opening the eyelids for the purpose of seeing, and that most frequently towards the internal angle of the eye, the head and neck are often inclined in an awkward manner, so that in children a distortion of the neck and shoulders is at last produced, which cannot be rectified without difficulty, even after the trichiasis is cured. Unfortunately, also, children are impatient of the uneasiness arising from the inflected hairs, and, therefore, are continually rubbing the eyelids, which act very much increases all the ill effects of the complaint, such as the varicose chronic ophthalmy, opacity, and ulceration of the cornea.

The cure of the second species of trichiasis, or that which is commonly met with in practice, is accomplished by artificially everting the eyelid, and fixing it permanently in its natural position, together with the eyelashes, which so grievously irritate and press against the globe of the eye. According to Professor Scarpa, this indication is perfectly fulfilled by the excision of a piece of the skin close to the edge of the eyelid, of such a breadth and extent, that, when the cicatrix is formed, the tarsus and margin of the eyelid may be turned outwards, and sufficiently separated from the eyeball, the cicatrix of the integuments affording a point of support fully adequate to keeping the parts in their natural position and direction. Scarpa believes, that there are now very few modern surgeons, who, with a view to the radical cure of this disease, place any confidence, either in plucking out the inverted eyelashes; bending them outwards and retaining them so by means of adhesive plaster; or in plucking them out and destroying their roots with caustic: much less in extirpating the edge of the eyelid along with the hairs, or dividing the orbicularis muscle on the internal surface of the eyelid, under an idea that the disease is sometimes produced by a spasmodic contraction of it.

The following is the mode of proceeding recommended by Scarpa: the patient being seated in a chair, if an adult, or, if a child, laid upon a table, with the head raised, and firmly held by an assistant, who must stand behind the patient: the surgeon is to push outward, with the end of a probe, the hairs, which irritate the eye. Then, with a pair of dissecting forceps, or the ends of his fore-finger and thumb, (which answer equally well, and, in many cases much better, than forceps,) the operator should lift up a fold of the skin of the affected eyelid, taking great care, that the piece, which is taken hold of, corresponds exactly to the middle of the whole extent of the trichiasis; for, as we have already explained, sometimes the whole, sometimes a half, and, in other instances, only a third of the extent of the tarsus is inverted. The surgeon, with his left hand, must raise the fold of the skin, more or less, according as the relaxation of the integuments, and the inversion of the tarsus, are more, or less, considerable. The reason of this is exceedingly evident, viz. that the greater the quantity of skin is, which is raised, the greater is the quantity which will be cut away. Supposing the patient to be an adult, as soon as the fold of skin has been raised in a certain degree, the surgeon must request him to open his eye, and, if in this act, the tarsus and eyelashes resume their natural place and direction, the portion of skin already raised will be sufficient for the purpose. We must trust to our own judgment, with regard to children, as they seldom let us have recourse to the mode of discrimination just related. When the integuments are elevated, by means of a pair of dissecting forceps, and care is taken to lay hold of the skin precisely at the middle point of the whole extent of the trichiasis, it necessarily follows, that the consequent section of the skin will form an oval, and that the greatest width of the wound will correspond exactly, or nearly so, to the middle of the eyelid, and its narrowest parts to the angles, or commissures of the same. This contributes very materially to make the cicatrix correspond to the natural fold of the eyelid, and hinder the origin of a disease of an opposite nature to the one about to be remedied, towards the angles of the eye, viz. an eversion of the commissures of the eyelids. See *Ectropium.*

Besides this caution, relative to the situation and figure of the fold of the integuments to be cut off, the surgeon must be careful, that the division of the skin be made very near the inverted tarsus.

Were this circumstance neglected, the operator might have the mortification of finding, after the wound is healed, that, although the eyelid is shortened, on the whole, from the eyebrow to the place of the recision, yet it is not equally so at the space, which is between the edge of the eyelid, and the cicatrix of the skin. Hence, the tarsus would remain inverted, as before, or not be sufficiently turned outward to keep the eyelashes from rubbing against the eye. This inconvenience would oblige the patient to submit to a second operation, done lower down, than the first.

Things being thus arranged, the surgeon, holding up the fold of skin by means of the forceps, in his left hand, is with a pair of probe-pointed, sharp curved scissars, to cut off the whole of the duplicature, being first sure, that one of the blades of the instrument is applied close to the edge of the eyelid. If both eyelids should be affected, the same operation must immediately be done upon both of them, with such cautions, and, in such proportion, as the extent of the disease, and the degree of inversion of each eyelid may require.

Scarpa next dissuades us from employing any suture to unite the wound, and represents, that it will be sufficient to keep the eyebrow as much downward as possible, if the operation has been done on the upper eyelid, or, if on the lower, to support it against the inferior arch of the orbit, by pressing it from below upwards, so as to keep the edges of the wound from becoming separated. Then the lips of the wound are to be put into exact contact, by means of strips of adhesive plaster, which should extend from the superior arch of the orbit to the zygoma, and the support of the wound in apposition will be still more securely effected by placing two compresses, one on the eyebrow, and another on the zygoma, together with a bandage.

On taking off the first dressings, the third day after the operation, the surgeon will find, that the patient can open his eye with ease, and that the inverted tarsus and eyelashes have resumed their natural position and direction. In the partial, or incomplete trichiasis, or that which only occupies a half, or a third of the whole length of the tarsus, and in subjects, who have had the skin of the eyelids very loose, Scarpa has often had the pleasure of finding the wound perfectly united on removing the first dressing.

When, however, only a part of the incision has healed, while the rest seems disposed to heal by suppuration and granulation, the surgeon is to cover the wound with small piece of lint, spread with the unguentum cerussæ; and, if the sore should become flabby, it must be touched, every now and then, with the argentum nitratum, until the cure is perfected, which commonly happens in the course of a fortnight.

Thus far, Scarpa's observations have related to the radical cure of the second or most frequent, kind of trichiasis.

With regard to the first form of this disease, or that, in which the eyelashes project against the eyeball, without the natural position of the tarsus being at all altered (a case, which is fortunately very rare), the accomplishment of a cure is very difficult, since, as we have already explained, neither the pulling out of the hairs, nor burning the situation of their roots, are means at all to be depended upon for producing a complete cure of the disorder; and since, turning the tarsus, out of its natural position, would make the patient liable to an irremediable flowing of the tears over the cheek, attended with a chronic thickening of the lining of the eyelid. The treatment of this species of trichiasis is still imperfectly understood, and seems to claim more attention, than it seems hitherto to have had paid to it. In the instance of this form of the disease, which Scarpa met with, only two or three of the eyelashes inclined against the eyeball. He found, on turning the eyelid a little out, opposite to the situation of the faulty hairs, that he could not, indeed, completely put them in their natural position; but, he saw, that he could thus remove them so far from the cornea, that they would not rub against it, without altering the position of the eyelids so much as to occasion a perpetual discharge of the tears over the cheek. And, as in the patient alluded to, the skin about the eyelid was very tense, Scarpa deviated from the above rule, by making an incision with the back of the lancet, near the tarsus, three lines long, and he took away a small piece of skin of the same length; but, very little more than one line broad. When the cut healed, the operation was found to answer as well as the nature of the case would allow, though the cure was not complete, nor would the plan have obviated all inconveniences in cases of greater extent.

The trichiasis being cured, something more always remains to be done, for the purpose of correcting the cause of the disease, as well as curing the disorder of the eye, occasioned by the previous friction and irritation of the inverted hairs. The usual indications are, to restore the tone of the vessels of the conjunctiva, to lessen the swollen Meibomian glands, and to remove any cloudiness of the cornea.

Two new methods of performing the operation, for the cure of trichiasis, have been recently proposed by Dr. Crampton and Mr. Saunders.

The following is the account, which Dr.

Crampton gives of his plan, which he tried in one instance with complete success. "Let the eyelid be well turned outwards by an assistant; let the operator then with a lancet divide the broad margin of the tarsus completely through, by two perpendicular incisions, one on each side of the inverted hair, or hairs; let him then, by a transverse section of the conjunctiva of the eyelid, unite the extremities of the perpendicular incisions. The portion of cartilage, contained within the incisions, can then, if inverted, with ease be restored to its original situation, and retained there by small strips of adhesive plaster, or, perhaps, what is better, by a suspensorium palpebræ, adapted to the length of the portion of the tarsus, which it is intended to sustain, should one, or two hairs be displaced without inversion of the tarsus." (*Essay on the Entropeon, p.* 55.)

Mr. Saunders entertained a favourable opinion of Dr. Crampton's operation for the cure of the disease in its early stage; but, he contended, such a vicious bending of the tarsus inward was often the consequence of repeated ophthalmy, attended with ulceration of the conjunctiva and inside of the eyelid, so that every endeavour to rectify the wrong position of the tarsus, and restore its original direction, would be fruitless. Hence, he believed, that its excision was decidedly indicated; an operation, which is said to be followed by no pain, nor uneasiness, and which is sure in its effect. No particular shortening of the eyelid ensues; the deformity is materially lessened; and, unless the cornea be already too opaque, perfect vision is re-established. Mr. Saunders directs a piece of thin horn, or a plate of silver, having a curvature corresponding to that of the eyelid, to be introduced under this part, with its concavity towards the eyeball. On this instrument, the eyelid is to be stretched. An incision is to be made through the integuments and orbicularis palpebrarum, down to the tarsus, immediately behind the roots of the cilia. The cut should extend from the punctum lachrymale to the external angle. The exterior surface of the tarsus is then to be dissected, until the orbital margin is exposed, when the conjunctiva is to be cut through directly by the side of the tarsus, which must now be disengaged at each extremity. The punctum lachrymale must be left uninjured. The operation is described as being exceedingly simple, and, if any embarrassment arises, it is from the hemorrhage of the ciliary artery, the blood sometimes obscùring the punctum lachrymale, just when the operator is about to divide the tarsus by the side of it. No dressings are required, it being merely necessary to keep the eye covered for a few days. The skin will continue to be elevated, just as the perfect eyelid was; and though less completely, yet enough to leave the pupil clear, when the eye is moderately directed upward. In all the cases, in which Mr. Saunders operated, a fungus grew from the wound. He recommends the excrescence to be destroyed with caustic, or the knife.

Respecting this operation, I shall merely observe, that it is more severe, than that advised by Professor Scarpa, and must leave more disfigurement. Unless, therefore, the latter method prove ineffectual, I see no reason for abandoning it.

Inversion of the lower eyelid is much less common, than that of the upper one. The late Mr. Saunders never saw this disease arise from the same causes, which induce it in the upper eyelid, though he acknowledges the possibility of such a case. However, he met with several instances of the affection, in consequence of encysted tumours, which, as they increased, carried the orbital edge of the tarsus outwards, and, in the same proportion, inclined the ciliary edge towards the globe of the eye.

An inversion of the inferior palpebra is sometimes produced by inflammation and swelling of that part of the conjunctiva, which connects the eyelid with the eyeball. In cases of ophthalmy, this membrane often forms between the latter parts a distinct fold, which is situated just on the inside of the orbital edge of the tarsus, and pushes it outward; while the contraction of the orbicularis muscle turns the ciliary edge inwards, and inclines it between the swelling of the conjunctiva and the eye. In this particular case, Mr. Saunders assures us, that replacing the eyelid in the early stage of the disease, and maintaining it so, until the ophthalmy has been lessened by proper means, will be found effectual. But, when the conjunctiva is much thickened and indurated, Mr. Saunders recommends cutting such diseased part of it away, and the application of compresses to keep the orbital margin of the tarsus inward.

Albinus has recorded a species of trichiasis, which originated from the growth and inversion of one of the hairs upon the caruncula lachrymalis. The plan of relief consisted in plucking out the irritating hair; but, as Scarpa observes, it should have been mentioned, whether the hair grew again, and in what direction?

On the preceding subject, consult particularly *Scarpa sulle principali Malatiie degli Occhi*; *Crampton's Essay on Entropeon*; *Saunders's Obs. on several practical Points relative to the Diseases of the Eye*; *Richter's Anfangsgrunde der Wundarzneykunst*, *Band*. 3.

**TRISMUS.** (from τριζω, to gnash the teeth.) The locked jaw. See *Tetanus*.

**TROCHAR**, or **Trocar.** (from the French, *trois-quart*, three-fourths, from its point being of a triangular form.) An instrument used for discharging aqueous fluids, and now and then, matter from different cavities in the body, particularly, those of the peritoneum, and tunica vaginalis, in cases of ascites and hydrocele. Trocars are also employed for tapping the bladder, dropsical ovaries, &c.

A trocar consists of a perforator, or stilette, and of a cannula, which latter is so adapted to the first piece of the instrument, that, when the puncture is made, they both enter the wound together, with perfect ease, after which the stilette being withdrawn, the cannula remains in the wound, and gives a ready passage for the fluid outward.

Such are, the use of a trocar, and the principle, on which it should be constructed. It would be unnecessary in this work to detail every little particularity in the instrument. I shall just observe, that the triangular-pointed trocars seem to retain the greatest share of approbation; for, although those of a flat, lancet-pointed shape enter parts with more ease, their cannulæ are not large enough for the ready escape of fluids, which are at all thick, gelatinous, or blended with hydatids, and flaky substances.

The trocar, which is used for puncturing the bladder from the rectum, should be eight, or nine inches long, and of a curved form.

Surgeons ought always to have at least three trocars; one of full size; another of middling width; and a third of small dimensions. In cases of hydrocele, the latter is often preferable to a larger one.

**TRUSS.** (*trousse*, French.) *Bracherium.* A bandage, or apparatus, for keeping a hernia reduced.

Trusses are either of an elastic or non-elastic kind: the latter cannot be much depended upon, and are now seldom employed. The *spring* is a very essential part of every elastic truss, and it consists of a narrow piece of steel, which is adapted to the side of the body, on which the hernia is situated. The front part of the steel spring has an expanded form, and, when the truss is properly applied, ought to be situated over the mouth of the hernial sac. Under the back surface of the anterior end of the spring is placed the pad, which should be adapted in shape and size to the passage, which it is intended to shut up. The steel spring is usually covered with leather, is lined with soft materials, and after being put on the patient, it is fastened in its situation by means of a strap, which extends from the two ends of the spring, round that side of the body, on which the hernia is not situated.

When the pad of the truss cannot be kept from rising too high, another strap, passing under the thigh from the back of the spring to its anterior end, becomes necessary. Sometimes, a band, extending over the shoulder, is requisite for keeping the pad from descending too low.

The springs of trusses, intended for children, and persons, who do not undergo much labour and exertion, need not be made so strong, as those designed for hard-working, active people.

The idea, that children cannot wear steel trusses, is as erroneous, as it is dangerous in its practical consequences. Mr. Pott has strongly written against this ill-founded supposition.

When great pressure, and a very strong spring, are found necessary for keeping a hernia securely reduced, and the spermatic cord swells and inflames in consequence of such pressure, it is better to have a little excavation in the pad, for the reception of this part.

Some trusses are formed with pads, which are moveable on a rack, so that their position can be altered, and adapted to the parts, with the greatest ease.

A compress of calico, placed under the pad, preserves the instrument from the effect of perspiration, and makes the truss fulfil its object in a better manner.

In the article *Hernia*, we have given an account of the truss for umbilical hernia, invented by Mr. Morrison, and described by Mr. Hey. In the same part of this Dictionary may also be found some observations, relative to the place, against which the pressure of the pads of trusses should be directed in cases of inguinal hernia, in conformity to Mr. A. Cooper's description of the situation, at which the parts first protrude from the abdomen.

**TUMOUR.** A swelling. In the present article, I merely intend to treat of, what are usually called, sarcomatous and encysted tumours. Mr. Abernethy thinks, that the manner in which tumours are formed is best illustrated by those, which hang pendulous from the membranous lining of different cavities. This gentleman adverts to an example noticed by Mr. Hunter, in which, on the cavity of the abdomen being opened, there appeared lying upon the peritoneum, a small portion of red blood recently coagulated. This, on examination, was found to be connected with the surface, upon which it had been deposited, by means of an attachment, half an inch long, and this neck had been formed before the coagulum had lost its red colour, (See *Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol.* 1, *p.* 231.) Mr. Abernethy observes, that if vessels had shot through the slender neck, and organized the clot of blood, this would then have become a living part: it might have grown to an indefinite magnitude, and its nature and progress would probably have depended on the organization, which it had assumed. He mentions his having in his own possession a pendulous fatty tumour, which was found growing from the surface of the peritoneum, and which was undoubtedly formed in the same manner as the tumour noticed by Mr. Hunter, viz. by vessels shooting into a piece of extravasated blood, or lymph, and rendering it a living organized substance. Tumours, in every situation, and of every description, are probably formed in the same way. The coagulating lymph being effused, either accidentally, or in consequence of disease, is afterwards converted into a living part, by the growth of the adjacent vessels and nerves into it. Mr. Abernethy remarks, that, when the deposited substance has its attachment by a single thread, all its vascular supply must proceed through that part; but, in other cases, the vessels shoot into it irregularly at various parts of its surface. Thus an unorganized concrete becomes a living tumour, which has at first no perceptible peculiarity as to its nature. Although its supply of blood is furnished by the vessels of the surrounding parts, it seems to live and grow by its own independent powers, while its future structure seems to depend on the operation of its own vessels. Mr. Abernethy conceives, that the altered structure of an enlarged gland affords no contradiction to the above account, as, in this latter case, the substance of the gland is the matrix, in which the matter forming the tumour, or enlargement, is deposited. According to Mr. Abernethy, the structure of a tumour is, sometimes, like that of the parts, near which it grows. Such, as are pendulous in joints, are cartilaginous, or osseous. Fatty tumours, he observes, frequently form in the midst of the adipose substance, and he has seen some tumours growing from the palate, which had a slender attachment, and resembled the palate in structure.

However, this resemblance of the structure of a tumour, to that of the neighbouring parts, is not always observable. I have in my own possession a completely cartilaginous tumour, which I found in the midst of the fat near the kidneys. The pendulous portion of fat, growing from the peritoneum, and mentioned by Mr. Abernethy, serves as another instance of the fact; and, one might add, that every polypus, which we meet with, bears no resemblance in structure to the neighbouring parts. Mr. Abernethy mentions his having seen bony tumours, which were unconnected with bone, or the periosteum, and he observes, that the structure of a tumour is, in general, unlike that of the part, in which it is produced.

When the coagulable part of the blood is effused, and the absorbents do not take it away, the surrounding blood-vessels grow into it, and convert it into a vascular tumour. The effusion of the coagulable part of the blood may be the effect of accident, or of a common inflammatory process, or it may be the consequence of some diseased action of the surrounding vessels, which (diseased action) may influence the organization, and growth of the tumour.

In the former cases, the parts surrounding the tumour may be considered simply as the sources, from which it derives its nutriment, whilst it grows apparently by its own inherent powers, and its organization depends upon actions begun and existing in itself. If such a tumour be removed, the surrounding parts being sound, soon heal, and a complete cure ensues. But, if a tumour be removed, whose existence depends on the disease of the surrounding parts, which are still left, and this disease be not altered by the stimulus of the operation, no benefit is obtained. These parts again produce a diseased substance, which has generally the appearance of fungus, and, in consequence of being irritated by the injury of the operation, the disease is in general increased, by the means, which were designed for its cure. It appears, therefore, that in some cases of tumours, the newly formed part alone requires removal, whilst, in others, the surrounding substance must be taken away, or a radical cure cannot be effected. (*Surgical Observations, by John Abernethy, F. R. S. &c.* 1804.) This gentleman conceives, that the irritation of the tumour itself, when once the swelling has been produced, keeps up an increased action in the surrounding vessels, so as to become a sufficient cause of the disease continuing to grow larger. As the tumour becomes of greater magnitude, it condenses the surrounding cellular substance, and thus makes for itself a sort of capsule. The close, or loose manner in which tumours become connected with the surrounding parts, seems to depend very much on the degree of irritation, and inflammation excited in the circumjacent parts. When a tumour has been at all tender, painful, and inflamed, it is generally found intimately adherent to all the neighbouring parts. Mr. Abernethy conceives, that the increased irritation, which a tumour creates, when it has exceeded a certain size, may explain, why some tumours, which are at first slow in their progress, afterwards begin to grow with great rapidity.

The process, by which tumours are formed, is commonly thought to be attended with an increased action of the vessels, which supply the swellings with blood. It is supposed, in short, to be the same kind of process, which forms all the thickenings and indurations, which, under various circumstances, occur in all the different parts of the human body. It has sometimes been named *chronic* inflammation, to distinguish it from that, which is more quick in the production of certain effects, and is attended with a manifest throbbing in the part affected.

It seems generally to be admitted, that the growth of all tumours may always be retarded, and that sometimes, they may even be diminished by means of topical bleeding with leeches, and keeping the parts in a continually cool state, by the incessant application of cold sedative washes. Afterwards, when the increased action of the vessels seems checked, and the tumour ceases to enlarge, discutients are indicated, such as frictions with mercurial ointment, pressure, electricity, rubefacient plasters, solutions of salts, blisters, and issues. Very few sarcomatous or encysted tumours, however, are ever completely removed by these local means. The swelling, on the contrary, generally increases, notwithstanding them, and the irritation of these diseases by the latter stimulants, is not altogether unattended with danger of the affections becoming changed by them into very malignant, and dangerous cases, sometimes to all appearances, cancerous. The most advisable plan is to recommend the removal of all these tumours with the knife, while they are small, and in an incipient state. For thus they are got rid of by an operation, which is certainly trivial, compared with the one, which may afterwards become requisite, when the disease has attained an enormous magnitude.

TUMOURS, SARCOMATOUS. These have been so named, from their firm, fleshy feel. They are of many kinds, some of which are simple, while others are complicated with a malignant tendency. Mr. Abernethy has attempted to form a classification of sarcomatous tumours, for the different species of which he has proposed names, deduced from the structure, which they exhibit on dissection. This gentleman has named the kind of swellings, which he first considers, *Common Vascular*, or *Organized Sarcoma.* Under this title, Mr. Abernethy includes all those tumours, which appear to be composed of the gelatinous part of the blood, rendered more or less vascular by the growth of vessels through it. The vessels which pervade this substance are, in different instances, either larger, or smaller; and more, or less numerous; being distributed in their usual arborescent manner, without any describable peculiarity of arrangement. Perhaps, all the varieties of sarcomatous tumours are at first of this nature. The structure, under consideration, is met with not only in distinct tumours, but, also, in the testis, mamma, and absorbent glands. When a common vascular, or organized sarcoma, has attained a certain magnitude, the veins of the skin seem remarkably large, and their winding under the integuments excites notice. This kind of sarcoma is not at all tender, so that it may be freely handled, and also electrified, without giving pain. The tumour sometimes grows to such a size, that the skin bursts, the substance of the swelling sloughs out, and the disease is got rid of. However, this mode of cure is attended with such terrible local appearances, and so much fever, &c. that the removal of the disease with the knife is to be preferred.

The second kind of sarcomatous tumour, noticed in Mr. Abernethy's classification, is the *Adipose Sarcoma.* Every one, at all in the habit of seeing surgical diseases, must know, that fatty tumours are exceedingly common. There can be little doubt, that these swellings are formed in the same manner, as others, viz. in the first instance, they were coagulable lymph, rendered vascular by the growth of vessels into it, and that their future structure depended on the particular power and action of the vessels. Adipose sarcomatous tumours always have a thin capsule, formed by the simple condensation of the surrounding cellular substance. It adheres very slightly to the swellings. and, chiefly by means of vessels, which pass through this membranous covering in order to enter the tumour. As Mr. Abernethy has accurately described, the vessels are so small, and the connexion so slight, that, in removing the tumour, no dissection is requisite, as the operator may easily put his fingers between the swelling and its capsule, so as to break the little vascular connexions, and entirely detach the disease.

Adipose tumours are never furnished with any large blood-vessels, and the fear of hemorrhage, which frequently deters surgeons from operating, is very unfounded. It is an undoubted fact, that there is no species of tumour, that can be removed with so much celerity, with such apparent dexterity, or with such complete security against future consequences, as those of an adipose nature. However, now and then, when the tumour has been at all in an inflammatory state, the capsule becomes thickened, and intimately adherent to the surface of the swelling, so that the separation of the disease is more difficult, and requires the knife to be longer employed. The tumour also sometimes becomes, after inflammation, closely adherent to the contiguous parts. Adipose tumours often acquire an enormous magnitude; Mr. Abernethy relates an example of one, removed by Mr. Cline, which weighed between fourteen and fifteen pounds. In this state, of course, the immense size of a wound, requisite for the removal of the tumour, must be dangerous, and it is a strong argument in favour of having recourse to the operation at an earlier period.

The next species of sarcoma, noticed in Mr. Abernethy's classification, is what this gentleman names *pancreatic*, from the resemblance of its structure to that of the pancreas. This kind of disease, according to Mr. Abernethy, is occasionally formed in the cellular substance; but, more frequently, in the female breast, on that side of the nipple, which is next to the arm. When a pancreatic sarcoma is indolent, and increases slowly, the surrounding parts, and the glands in the axilla, are not affected. But, some of these swellings deviate from their common character, and become of a very irritable nature, occasioning severe and lancinating pain, and producing an inflammatory state of the skin covering them, so that it becomes adherent to their surface. The absorbents leading to the axilla are also irritated, and the glands enlarged. Pancreatic sarcomas do not grow to a very large size; but, when their progress is unrestrained, the pain, attendant on the disease, becomes lancinating, and so severe, as to make the patients feverish, and lose their health and strength. Mr. Abernethy remarks, that, when the axillary glands become affected, one generally swells at first, and is extremely tender and painful; but, afterwards the pain abates, and the part remains indurated. Another then becomes affected, and runs through the same course.

Another species of sarcoma, Mr. Abernethy has characterized by the epithet *mastoid* or *mammary*, from the resemblance which this gentleman conceives its structure bears to that of the mammary gland. This kind of disease, Mr. Abernethy says he has not often seen. In the example, which he met with, the tumour was about as large as an orange, and situated on a woman's thigh. The swelling was removed by an operation; but, the wound afterwards degenerated into a malignant ulcer, attended with considerable induration of the surrounding parts, and the woman died of the disease in two months. Mr. Abernethy conceives, that the whole of the morbid part had been cut away, but, that the contiguous parts had a disposition to disease, which was irritated by the operation, and, that if the nature of the case could have been known beforehand, it would have been right to have made a freer removal of the substance surrounding the tumour.

Mr. Abernethy places the mastoid sarcoma, between such sarcomatous swellings as are attended with no malignity, and the following ones, which have this quality in a very destructive degree.

The *tuberculated* sarcoma is composed of a great many small, firm, roundish tumours of different sizes and colours, connected together by cellular substance. Some of the tubercles are as large as a pea; others equal a horsebean in size; most of them are of a brownish red colour; but some are yellowish. Mr. Abernethy mentions his having seen this species of sarcoma chiefly in the lymphatic glands of the neck. The disease proceeds to ulceration; becomes a painful and incurable sore; and ultimately occasions death.

Another kind of sarcoma, mentioned in Mr. Abernethy's classification of tumours, is distinguished by the epithet *medullary*, from its having the appearance of the medullary matter of the brain. It appears to be an exceedingly malignant disease; communicates to the lymphatic glands a similar distemper; ulcerates and sloughs, and at last proves fatal. It is particularly apt to make its attack on the testis, and it is treated of in another part of this book. (See *Testicle, Diseases of.*)

Mr. Abernethy includes also in his classification *carcinomatous* sarcoma. (See *Cancer.*)

I must refer to another article, (*Mamma, Removal of*) for an account of the plan of operating in removing sarcomatous tumours.

One of the boldest operations of this kind, ever undertaken, was that lately performed by Mr. Goodlad, of Bury, in Lancashire. The case was an immense tumour, situated on the left side of the face and neck, and the base of which was about twenty-eight inches in circumference. The disease extended from the external canthus of the eye above to within three quarters of an inch of the clavicle below, and some idea of the depth of its attachments may be conceived, when it is known, that the whole parotid gland was involved in it. For the purpose of obviating all danger of hemorrhage, Mr. Goodlad began with tying the carotid artery. The nature of the operation will be best understood by adverting to the appearances afterwards presented by the wound. "The whole sterno-mastoid muscle was exposed, and its fibres dissected clean, except about half an inch from its insertion into the clavicle. The wound extended backwards from behind the mastoid process to the trachea anteriorly, but became narrower in the direction of the muscle at the lower part of the neck. The submaxillary gland was exposed, and about one fifth of its substance, not appearing healthy, was removed. The digastric and the greater portion of the mylo-hyoideus were exposed. The ramus of the jaw was only covered by periosteum, except where covered by the masseter muscle, part of which, not appearing healthy, was dissected away. The whole of the condyloid process of that bone was laid bare in the same manner, and behind it the pterygoid muscles were also exposed. The membrane of the cheek was only covered by a cellular substance, which did not appear healthy; but, sufficient skin was saved to cover the zygoma. *The parotid gland was entirely removed.*" This enormous wound healed in ten weeks. (See *Medico-Chirurgical Transactions, Vol.* 7, *p.* 112, *&c.*)

Respecting the foregoing severe operation, many surgeons may be inclined to doubt the propriety of tying the carotid artery, as a preparatory step, and, indeed, it is positively condemned in an anonymous note attached to the above case, simple temporary pressure on the exposed vessel being represented as preferable. It appears to me, however, that Mr. Goodlad's method was justifiable, and on the whole the best, because the application of the ligature to the carotid not only removed the dangers of hemorrhage during the operation, but obviated them afterwards, and no doubt lessened the necessity for a prodigious number of ligatures for vessels, which would otherwise have poured out a profuse quantity of blood.

On the question, whether it would not have been better to have been content with simply tying the carotid artery, and tried, whether stopping this large supply of blood to the diseased parts, would not have been followed by an absorption of the tumour, probably all surgeons will not entertain an unanimous opinion. The success of Mr. Goodlad's operation, and the uncertain efficacy of the other plan, will no doubt incline many practitioners to prefer the bold method of extirpation. Yet, others will perceive, that such an operation, notwithstanding its success in the example before us, was dreadfully severe, and would of itself in the generality of cases have fatal consequences. They will also be encouraged, in any similar instance to try the effect of the ligature, by the cure which Mr. A. Cooper has lately accomplished, of an enormous cutaneous enlargement of the lower extremity by tying the artery in the groin. Indeed, I am sure, that as the improvements in modern surgery advance, the plan of curing tumours by cutting off their main supply of blood, will be much more extensively adopted, than has hitherto been the case. In this way, the surgeon may attempt the dispersion of many tumours, which could not be meddled with in any other manner, and which, if left to themselves, must have a fatal termination.

Tumours Encysted. These, which are also commonly named wens, consist of a cyst, which is filled with different substances. When the contained matter is fatty, it is termed a *steatoma;* when somewhat like honey, *meliceris*; when like pap, *atheroma.* These are the three species, into which writers usually divide encysted tumours. However, some of these swellings do not conform to either of the above distinctions, as their contents are subject to very great variety indeed, and are occasionally of an earthy, bony, or horny nature. It is said, that some encysted tumours of the latter description have occasionally burst, and assumed the appearance of horns, by the gradual projection of the matter secreted in their cysts. (See *Home's Obs. on this Subject, in the Phil. Trans.*) I remember seeing an excrescence of the kind alluded to, removed some years ago from the scrotum of a man in St. Bartholomew's Hospital. Sir James Earle performed the operation, and, if I am not mistaken, the preparation of the disease is in Mr. Abernethy's museum.

I suppose every body in London has now seen in the British Museum the horn deposited there as a curiosity, and which, with another of the same size, grew upon the head of a human subject. What is equally curious, hairs are not unfrequently found growing in the cavities of encysted tumours, (*Delpech Précis des Maladies Reputeés Chirurgicales, Tom.* 3, *p.* 412.); and even teeth, more or less perfectly formed, have been strangely met with in the same situations. An interesting specimen of the latter occurrence, in a double encysted tumour in the orbit, has been recently published by my friend Mr. Barnes, of Exeter. (See *Medico-Chir. Trans. Vol.* 4, *p.* 316.)

Encysted tumours are generally of a roundish shape, and are more elastic, than fleshy swellings. However, the latter circumstance depends very much on the consistence of the contents, and the thickness of the cyst. As far as my observation extends, encysted tumours form more frequently on the head, than any other part; but, they are very frequently met with in all situations under the integuments, and sometimes in deeper places. Encysted tumours are also very often seen on the eyelids.

Some surgeons have tried to cure encysted tumours by pricking them with needles, and squeezing out their contents; or by applying stimulating, and discutient applications to them. This practice, however, is by no means prudent; for, it seldom succeeds, and sometimes, in consequence of making the cyst ulcerate, it induces a terrible disease, in which a frightful fungus shoots out from the inside of the cyst, attended with immense pain and irritation, and often proving fatal. In order to confirm this statement, I shall quote the following case, recorded by Mr. Abernethy.

A gentleman, of a stout make, and about forty years of age, had a tumour, supposed to be sarcomatous, which had formed beneath the integuments on the lower edge of the pectoral muscle. It was occasionally attended with severe pain, in which state it rapidly increased in size, and produced a great deal of fever and irritation, which made him look very sickly, and emaciated. Some persons even considered the disease cancerous.

When the tumour had acquired a magnitude of about four inches in length, and three in breadth and depth, he submitted to its removal; the integuments were divided and turned back, and the tumour dissected off the surface, and, in some degree, from under the edge of the pectoral muscle.

When the tumour was examined, it was found to be composed of a steatomatous substance, contained in a thin capsule. The substance resembled that, which I have described as being sometimes found in cells in the testis, or intermixed with the diseased organization of that part. It was firm, and resembled cheese in its yellow colour and unctuous appearance; but, it was not unctuous to the touch.

The wound made in the operation soon healed, and the patient's health was restored to as good, or seemingly a better state, than before the formation of this disease. He also regained his usual athletic form. But, in less than three months after his recovery, two new tumours formed, one above, and the other below the cicatrix of the wound. The patient did not particularly attend to them till they had attained a size equal to that of a large walnut. To dissect out both these tumours, and make so free a removal of parts as to render it probable, that no new growth would ensue, seemed to be a very formidable operation; and, as the nature of the former tumour was known, and it was supposed, that these were of the same nature, it was agreed to puncture the upper one, to express the contents, and await the event. This was done by a puncture of half an inch in length, made by an abscess lancet. The contents were exactly like those of the original tumour. Vehement erysipelatous or irritative inflammation took place, and sloughing about the diseased part: the inflammation rapidly extended to the opposite side of the thorax, and then down the integuments of the abdomen to the groin. The derangement of the constitution was as violent as the local disease, and, in about a week, the patient died. (*Surgical Observations,* 1804, *p.* 94.)

Similar, alarming, fungous diseases are also apt to arise, whenever the surgeon, in cutting out encysted tumours, leaves any part of the cyst behind.

The most advisable method is to have recourse to the knife, before an encysted tumour has attained any considerable size. When it is large, however, before the operation is resorted to, a portion of the skin must be taken away with the swelling in the manner mentioned in the article *Mamma, removal of.* The chief piece of dexterity in the operation consists in detaching all the outside of the cyst from its surrounding connexions, without wounding it. Thus, the operator takes the part out in an entire state, and is sure, that none of the cyst remains behind. When the cyst is unskilfully opened, some of the contents escape, it collapses, and the dissection is rendered more tedious and difficult.

**TYMPANUM.** For an account of its diseases, see *Ear.*

# U.

**ULCERATION,** is the process, by which sores, or ulcers, are produced in animal bodies. In this operation, the lymphatics appear to be, at least, as active as the blood-vessels. An ulcer is a chasm formed on the surface of the body by the removal of parts back into the system by the action of the absorbents. At first, it may be difficult to conceive how a part of the body can be removed by itself; but there is not more difficulty in conceiving this, than how the body can form itself. Both facts are equally well confirmed. When it becomes necessary, that some whole living part should be removed, it is evident, says Mr. Hunter, that nature, in order to effect this object, must not only confer a new activity on the absorbents;

but, must throw the part to be absorbed into a state, which yields to this operation. The absorption of whole parts in disease, arises from five causes; pressure; irritation of stimulating substances; weakness; inutility of parts; death of them. (*Hunter on Inflammation, &c. p.* 442—446.)

Ulceration, or, in other terms, absorption, takes place much more readily in the cellular, and adipose substance, than in muscles, tendons, ligaments, nerves, and blood-vessels. Hence, in the progress of pus to the surface of the body, ulceration often takes a circuitous course for the purpose of bringing the matter to the skin. The skin itself, also, being highly organized, considerably retards the bursting of abscesses. It is on this same account, that, when ulceration is spreading, the edges of the skin hang over the ulcerated surface. (*Hunter, p.* 447.)

New-formed parts, such as cicatrices, callus, and all adventitious new matter, such as tumours, readily admit of being absorbed. The adventitious matter, indeed, is more prone to be absorbed, than that which is a substitute for the old. Mr. Hunter explained this circumstance on the principle of weakness.

When ulceration takes place, in consequence of the death of an external part, it occurs first on the outer edge, between the dead and living substance.

Abscesses constantly make their way to the surface of the body by ulceration; but, as some textures more readily admit of being absorbed, than others, the matter often follows a circuitous course, before it can arrive at the skin. (*Hunter, p.* 448, 449.)

A tumour, when it makes equal pressure in every direction around, will only make its way in an external course, because what Mr. Hunter termed interstitial absorption happens in no other direction. (*P.* 449.)

The parts, which are situated between an abscess, or any extraneous substance, and the nearest surface, are those, which are most susceptible of ulceration. This is one of the most curious phenomena, connected with the process under consideration. It shews, that there is a principle in the human body, by which parts are always prone to free themselves of disease. Slight pressure from without will often produce a thickening of parts, and hence, Mr. Hunter remarks, there even appears to be a corresponding backwardness to admit disease. (*P.* 449.) Both these facts, he observes, are shewn in the case of fistula lachrymalis; for, though the matter is nearest the cavity of the nose, still it makes its way externally, by means of ulceration, while the Schneiderian membrane even becomes thickened, so as to become a barrier against the progress of the disease inward. (*P.* 451.)

There is one difference, between the advancement of an encysted tumour to the surface of the body, and the progress of an abscess in the same direction, viz. that the former does not excite ulceration of the cyst; but, an interstitial absorption of the sound parts, between the cyst and skin, till the cyst and external skin come into contact, at which period, inflammation takes place, and absorption becomes accelerated into ulceration. In an abscess, the progressive ulceration begins in the cyst, at the same time, that the interstitial absorption in the sound part, covering the matter, is going on. (*P.* 452—457.)

The action of progressive absorption is to remove surfaces contiguous to irritating causes, which Mr. Hunter referred to pressure, irritation, and weakness. In cases of tumours, pressure becomes a cause. The buttocks and hips of persons, who lie long on their backs, often ulcerate. The heels of many patients, with fractures, who lie for a great while in the same position, are apt to ulcerate. In the latter instances, Mr. Hunter conceived, that ulceration is a substitute for mortification, and is, at the same time, a proof of a certain degree of strength; for, if the patient's constitution were very weak, the same parts would mortify. (*P.* 453.) That pressure is a frequent cause of ulceration, is also evinced by the occasional effects of chains on prisoners, and harness on horses.

That irritating substances produce ulceration, needs no illustration.

Progressive absorption may occur either with, or without suppuration. We have instances of the latter in cases of extraneous bodies, which travel about the body, without producing irritation enough to give rise to the secretion of pus. In the progress of aneurisms of the aorta, and of fungous tumours of the dura mater to the surface, the same fact is also illustrated. (*P.* 455.)

Absorption with suppuration, in other words, ulceration, either happens in consequence of suppuration already begun, in which event the pus acts as pressure; or else absorption attacks external surfaces from particular irritations, or weakness, in which case, suppuration must follow. (*P.* 456.)

The production of ulceration requires much greater pressure from without, than from within. The process is always disposed to take place more quickly, when near the surface of the body, and its progress becomes accelerated, in proportion as it arrives near the skin.

The adhesive inflammation precedes the

suppurative, and prevents the pus from becoming diffused, as soon as it is secreted, and when the cyst afterwards ulcerates, in order to let the matter approach the skin, the adhesive inflammation still continues to go before the ulcerative process, and thus prevents the matter from insinuating itself into the interstices of the cellular substance. (*P.* 457.)

The pain of ulceration is, in some degree, proportioned to its quickness. When ulceration begins on a surface, or takes place for the purpose of bringing matter to the skin, the pain is always considerable. When ulceration takes place, in order to separate a dead part, as in sloughing, exfoliations, &c. there is seldom any particular pain. (*P.* 459.)

The ulcerating sore always exhibits little cavities, while the edge of the skin is scolloped, and thin, at the same time, turning a little out, and overhanging, more, or less, the ulcerated surface. The face of the sore appears foul, and the discharge is very thin.

When ulceration stops, the edges of the skin become regular, smooth, a little rounded or turned in, and of a purple colour, covered with a semi-transparent white. (*Hunter on Inflammation, &c. p.* 460.)

The reader, desirous of further information, should particularly consult this last publication, and *Professor Thomson's Lectures on Inflammation, p.* 349, *&c.*

**ULCERS.** Surgeons usually define an ulcer to be a solution of continuity in any of the soft parts of the body, attended with a secretion of pus, or some kind of discharge.

In the present part of this Dictionary, there will not be occasion to speak of several kinds of sores, which have been treated of in other articles. (See *Cancer, Scrophula,* and *Venereal Disease.*)

Ulcers are divided into *local* and *constitutional.* As Professor Thomson has well observed, however, it is only within certain limits, that this distinction is well founded; for, an ulcer, which is at first completely local, may in time affect the system, so as to become constitutional; and ulcers, which derive their origin from some general affection of the system, may remain after the removal of the constitutional disorder, by which they were originally produced. (*Lectures on Inflammation, p.* 427.)

" Ulcers (says Dr. Thomson) have usually been distinguished from each other by the causes by which they are induced, by the symptoms which they exhibit, and by the parts of the body in which they occur. The want of a disposition to heal in a suppurating surface may depend upon some specific action in the cause, from which it proceeds, upon something peculiar in the constitution of the patient in whom it exists, or merely upon an improper mode of management: and, hence, the distinction, that has long been made, of ill-conditioned sores, or ulcers, into those which are *specific* in their nature, and into those which are *simple.*

" Specific sores, or ulcers, may be occasioned by specific poisons, or by particular diatheses. The sores, or ulcers, which arise from specific poisons, may be either *local,* that is, confined, like a primary syphilitic ulcer, to one spot; or *constitutional,* that is, liable to occur in any part, texture, or organ, such as secondary syphilitic ulcers. Of diatheses, predisposing to ulcers, we have examples in the scrophulous, scorbutic, and arthritic diatheses, and also in the syphiloid diathesis, or that which arises not unfrequently in those, who have had syphilis, from the too free and injudicious use of mercury.

" Every ulcer, strictly speaking, is of a local nature; but, there are ulcers, which, though necessarily local in their appearance, are connected with, or dependent upon, diseases, which affect the general system. These ulcers ought to be regarded as modifications of, or forms in which the diseases appear, with which they are connected. Considered in this light, it is obvious, that specific ulcers can be treated of with propriety, only under the head of the diseases, to which they respectively belong.

" We call those sores, or ulcers, *simple,* which do not appear to proceed from any specific disease, or morbid diathesis existing in the constitution of those, in whom they take place. They are usually solitary occurrences, and the consequences of accidental injuries, and improper modes of management. They may occur in every part of the body; but, they appear most frequently upon the lower extremities."

Professor Thomson afterwards remarks, that " the appearances, which different ulcers exhibit, seem, at first view, to afford an excellent foundation for distinctions among them, and so they undoubtedly do in many respects."

But, (says he) " it is to be regretted, that the characters, upon which the distinctions of ulcers, as well as of many other local diseases, are founded, are neither very uniform in their appearance, nor very easily distinguishable from one another. Not only are the local appearances, which present themselves, in simple ulcers, liable to great variations in the different stages of the same individual affection, but, they are often apparently the same with, or at least not easily distinguishable from, those which occur in specific diseases, and which require, for their cure, peculiar modes of treatment. It is this circumstance, which renders it so necessary for us, in endeavouring to distinguish and to cure ulcers, to avail ourselves of all the information, which we can procure from the history of the ulcer, from the nature of the exciting cause, by which it has been induced, and from the effects of the remedies, which have been employed, as well as from the particular appearances, which the ulcer itself exhibits."

In noticing another ground of distinctions among ulcers, or that derived from the parts in which they occur, Dr. Thomson observes, that "every texture and organ of the body possesses physical and vital qualities peculiar to itself; and these qualities must necessarily modify the appearances, which each texture and organ respectively exhibits in the state of disease. Specific diseases render some parts more liable, than others, to attacks of ulceration. Thus secondary syphilis appears most frequently in the throat; scurvy in the gums; cancer in the lower lip; and lupous and scrophulous ulcerations in the upper lip, or in the nose. Cancer seldom, or never appears primarily in the upper lip; but syphilis, when it attacks this part, puts on many of the appearances of cancer;" a fact, which Dr. Thomson says he first learned from Mr. Pearson. (See *Lectures on Inflammation, p.* 427-430.)

In the valuable treatise on ulcers, published by Sir Everard Home, these complaints are divided into six principal kinds, viz.

1. Ulcers in parts, which have sufficient strength to carry on the actions, necessary for their recovery.
2. Ulcers in parts, which are too weak for that purpose.
3. Ulcers in parts, whose actions are too violent to form healthy granulations, whether this arises from the state of the parts, or of the constitution.
4. Ulcers in parts, whose actions are too indolent, whether this arises from the state of the parts, or of the constitution.
5. Ulcers in parts, which have acquired some specific action, either from a diseased state of the parts, or of the constitution.
6. Ulcers in parts, which are prevented from healing by a varicose state of the superficial veins of the upper part of the limb.

Although I have chosen, in the subsequent columns, to adopt this nomenclature, I am perfectly aware of its being on some accounts objectionable, but, especially, because it assumes hypotheses, the truth of which can never be established, nor proved. This is one of the considerations, which have induced Professor Thomson to prefer the old names usually applied to ulcers; (*Op. cit. p.* 435—438.) and he therefore treats of the *Simple purulent ulcer; Inflamed ulcer; Fungous ulcer; Callous ulcer; Sloughing ulcer; Ulcerative ulcer; Carious ulcer; and Specific ulcers.*

### OF ULCERS IN PARTS, WHICH HAVE SUFFICIENT STRENGTH TO CARRY ON THE ACTIONS NECESSARY FOR THEIR RECOVERY: SIMPLE PURULENT OR HEALTHY ULCERS.

Sir E. Home remarks, that, in this species of ulcer, the pus is of a white colour, thick consistence, and readily separates from the surface of the sore, and when diluted, and examined in a microscope, is found to be made up of small globules, swimming in a transparent fluid. The granulations are small, florid, and pointed at the top. As soon as they have risen to the level of the surrounding skin; those, next to the old skin, become smooth, and are covered with a thin, semi-transparent film, which afterwards becomes opaque, and forms cuticle.

In the treatment of this kind of ulcer, it is only necessary to keep the surface clean, and prevent the natural processes from being interrupted. Sir E. Home observes, that this is in general best done, by the application of dry lint, for the purpose of absorbing and retaining the matter, which serves as a soft covering for the granulations, and by putting over the lint a pledget of any simple ointment, in order to hinder the matter from evaporating, by which means the dressings will not become adherent, and may be easily taken off, as often as requisite.

Although healthy ulcers require no medicated application to be made to them, the dressings must be such as do not disagree with the granulations, or surrounding skin.

With some patients, a roller applied with moderate tightness, with a view of retaining the dressings, will cause uneasiness in the part, and make the ulcer lose its healthy appearance. Sir E. Home states, that he has seen several such cases, in which the proper appearance of the sore returned as soon as the bandage was discontinued.

In some patients, ointment irritates and inflames the neighbouring skin; and certain superficial ulcers will not heal, while kept in a moist state, and unexposed to the air; but heal, when allowed to become dry and covered with a scab.

Sir E. Home refers these particularities to constitutional causes, and not disease; for, the ulcers heal as soon as the particular things, which disagree with them, are discontinued. These peculiarities in certain healthy sores may also attend others of a different description, and should always be discriminated from the effects of disease.

Sir E. Home very judiciously recommends enquiring of patients, who have previously had sores, what kind of applications they derived most benefit from, and what dressings were found to disagree.

### TREATMENT.

1. Applications in the form of vapour, and fomentations, should never be employed, as they render the texture of the granulations looser, and diminish the disposition to form skin.

2. With respect to fluid applications, Sir E. Home also very properly condemns poultices, as well as fomentations. He speaks of alcohol, as being an application, which promotes the formation of a scab, when this mode of cure is chosen.

3. In regard to ointments, their only use, in cases of healthy ulcers, is to keep the matter from evaporating. The most simple ointments are the best for the purpose; particularly the one composed of white wax and olive oil.

Sir E. Home observes, that the great objections to the common simple ointments are, that they sometimes disagree with the skin, even when recent, and free from all rancidity. When they have acquired the latter quality, they still more frequently create a greater degree of irritation.

4. With respect to applications in the form of powder, Sir E. Home remarks, that, when it is desirable to form a scab on the ulcer, any inert powder may be sprinkled on the sore; but, he prefers dry lint. Nothing should touch the powder, or lint, and, to prevent this circumstance, Sir E. Home recommends applying a little bolster on each side of the sore, and over them a roller, which will go from one bolster to the other, in the manner of a bridge.

For healthy ulcers, dry lint is to be regarded as being, upon the whole, the most eligible application. When the sore does not secrete pus enough in twenty-four hours to moisten the lint, the dressings are only to be changed every other day.

When a moderately tight bandage is not forbidden by constitutional peculiarities, it is useful, both in supporting the muscles and skin, which are often in a flabby state from the unexercised state of the limb, and in defending the newly formed parts. (See *Home on Ulcers.*)

### ULCERS IN PARTS WHICH ARE TOO WEAK TO CARRY ON THE ACTIONS NECESSARY FOR THEIR RECOVERY: THE OVERACTING ULCERS OF MR. BURNS; THE FUNGOUS ULCERS OF OLDER WRITERS.

This is the second of the classes, into which Sir Everard Home has divided ulcers in general.

The granulations of these sores are larger, more round on their external surface, and of a less compact texture, than those formed on ulcers in healthy parts. Sir E. Home has also noticed their semi-transparent appearance. When they have filled up the cavity of an ulcer to a level with the surface of the body, they do not readily form skin, but, rising up in a still higher manner, often lose altogether the power of producing new cutis. When the parts are still weaker, the granulations sometimes continue gradually to fill up the hollow of the ulcer, and then, all on a sudden, are suddenly absorbed, so as to leave the sore as deep as it was before.

Ulcers may be weak from the first, or become so in the progress of the case. Even granulations of the most healthy kind, if they are not skinned over in a certain time, gradually lose their primitive strength.

Sores on the legs are greatly under the influence of all natural peculiarities of the constitution, and every thing, which affects the health. When the constitution becomes in the least weaker or stronger, the appearance of the granulation becomes changed accordingly, and this effect of constitutional weakness, or strength, on ulcers is greater, in proportion as the sores are further from the source of the circulation.

While the constitution is undergoing any kind of disturbance, the healing of an ulcer is suspended. Mental anxiety is very apt to retard cicatrization.

Such effects of the constitutional kind on ulcers are greater in weak and delicate persons, than in the strong and robust. Change of weather has considerable influence over the healing of sores. Sir E. Home mentions, in proof of this fact, that when there were several hundreds of ulcers in the Naval Hospital at Plymouth, in 1778, every time the weather changed, from a dry to a moist state, the ulcers universally assumed an unhealthy appearance; but, put on a better aspect, when the weather became dry again.

In the treatment of this kind of ulcer, tonics are to be exhibited, particularly, bark and steel, and every thing which disagrees with the constitution is to be avoided. Wine and cordial medicines are also usually prescribed. Porter, however, is deemed better, than wine, for working people.

Sir E. Home observes, that the first object in the local part of the treatment, is to keep the granulations from rising above the edge of the surrounding skin. This gentleman (in my opinion) very judiciously represents the greater propriety of preventing the granulations from ever becoming too high by the employment of proper applications, than following the common plan of destroying the high granulations with escharotics, after they have risen to an improper height. There cannot be the smallest doubt, that if the granulations could always be prevented from rising up too much, the patient would suffer a great deal less pain.

Instead of applying to the surface of the ulcers, now under consideration, lunar caustic, blue vitriol, red precipitate, &c. Sir E. Home prefers mixing these escharotics with other substances, so as to render them only strong stimulants, and using them in this latter form. He conceives, that, when the high granulations are destroyed with escharotics, the disposition of the surface underneath to reproduce them is increased, but, that this is not the case, when the luxuriant parts are only stimulated, so as to become absorbed.

The same gentleman seems to think, that, when animal substances grow with great rapidity, they are, like vegetable ones, weaker, than when produced in a slower manner. Hence, Sir E. Home is of opinion, that the growth of granulations ought to be checked in the early stage of their formation, by some resistance, which they are just able to overcome, under which circumstances, they derive strength from the limited increase of action, which they are obliged to undergo.

On the same principle, according to Sir E. Home, the pressure of tight bandages is advantageous, and ulcers, which heal, while the patient is walking about, are not so apt to break out again as they are when healed, while the parts are in a state of perfect rest.

In the treatment of these ulcers, when the granulations have come to a proper height, and do not form a thin, semi-transparent pellicle upon their surface, they are to be considered as weak parts, and treated accordingly. Sir E. Home thinks, that, in this circumstance, the best plan, when no particularity of constitution forbids, is pressure, made with a thin piece of lead over the dressings, and supported with a tight bandage.

### OF APPLICATIONS TO ULCERS ATTENDED WITH WEAKNESS.

Although, strictly, we have no topical applications, which can directly communicate strength to granulations, there are certainly some, which prevent the granulations from exhausting themselves by luxuriant growth, and stimulate them to draw more blood from the arteries; which effects, as Sir E. Home remarks, render such granulations stronger.

1. This gentleman very properly condemns, as applications to weak ulcers, all relaxing fomentations commonly employed; and recommends, instead of them, the use of spirits of wine and the decoction of poppies, in equal proportions, not, however, to be applied hot.

2. With regard to moist applications, the same gentleman expresses his disapprobation of poultices, and mentions a weak solution of the argentum nitratum, as the most eligible application in an aqueous form.

3. On the subject of powdered substances, as applications to weak ulcers, Sir E. Home says, he has often tried bark, and the lapis calaminaris, without perceiving, that the former had any power of strengthening granulations, or the latter any virtue in disposing them to form new skin; properties commonly imputed to these applications.

Sir E. Home entertains no better opinion of plaster of Paris, or powdered chalk, employed with a view of promoting the formation of skin. Powdered carbon, he speaks of, as being more adapted to irritable, than weak ulcers. He praises powdered rhubarb, as particularly applicable to the latter kind of ulcer, because, it represses the luxuriant growth of the granulations, renders them small and compact, and disposes them to form skin. When, however, the granulations have risen above the level of the skin, it is not powerful enough to reduce them. When the rhubarb is too stimulating, it is to be mixed with a fourth part of crude opium in powder.

A piece of lint, a little less than the sore, is always to be put over the powder, and covered with a pledget of simple ointment.

4. Ointments, according to Sir E. Home, are particularly apt to disagree with weak ulcers. When other applications fail, however, greasy ones may be tried, and the above gentleman gives a preference to the ung. hydrarg. nitrat. mixed with hog's lard, in the proportion of one to five, or else to common cerate, blended with a small quantity of the hydrarg. nitrat. ruber.

### OF ULCERS IN PARTS, WHOSE ACTIONS ARE TOO VIOLENT TO FORM HEALTHY GRANULATIONS; EITHER FROM THE STATE OF THE PARTS, OR THE CONSTITUTION: SIMPLE VITIATED ULCERS OF MR. B. BELL.

There are three states of the constitution influencing the nature of ulcers: an irritable state, in which all the actions of the animal economy are more rapid, than in health; an indolent state, in which they are unusually languid; and, lastly, a diseased state, by which they are affected.

An irritable, and an indolent ulcer cannot in general be distinguished from each other by mere appearances, though they may be so in a few instances. Sir E. Home informs us, that the disposition of an ulcer, like the disposition of a constitution, can only be accurately ascertained by determining the actions, which arise from the different impressions made upon it.

The same gentleman notices, that the following appearances at once shew the ulcer to be of an irritable kind. The margin of the surrounding skin being jagged, and terminating in an edge, which is sharp and undermined. The bottom of the ulcers being made up of concavities of different sizes. There being no distinct appearance of granulations, but, a whitish spongy substance, covered with a thin, ichorous discharge. Every thing, that touches the surface, gives pain, and very commonly makes it bleed. The discharge is altered from common pus to a thin fluid, in proportion to the degree of irritability communicated to the sore by constitutional causes.

The pain of an irritable sore in general gradually becomes less. When it is not constant, but comes on in paroxysms chiefly in the evening, or night-time, with great violence, convulsive motions of the limb are apt to occur, and extend to various other parts. Sir E. Home refers this symptom to irritation communicated along the course of the nerves, and producing an action in them, attended with a violent contraction of the muscles, which they supply.

When the above-mentioned signs of an irritable ulcer are not present, we must form a judgment of the nature of the sore from listening to the history of the case, the effects of various applications, &c. When this kind of information cannot be obtained, Sir E. Home recommends the treatment to begin on the supposition of the ulcer being of an irritable nature.

When an ulcer occurs just over the malleolus externus, it is generally of an irritable kind, in consequence of the nature of the part, on which it is situated, quite independently of any constitutional, or local disposition to irritability. Sir E. Home conceives, that the periosteum, which here lies immediately under the skin, becomes the seat of the ulcer, is the cause of its being very difficult to heal, and gives it the irritable appearance. The fact, that sores, situated on the ligament of the patella and over the periosteum of the anterior surface of the tibia, assume a similar appearance, and are equally difficult to heal, made the above gentleman more confirmed in his sentiment.

In treating ulcers in general, the surgeon will find it exceedingly advantageous to be acquainted with the effects of a great many different external applications; for, a very few cases will continue to heal beyond a certain time, without some alteration in the treatment. The necessity of changing the applications, after they have been continued for a certain time, is strikingly illustrated by the fact, that leaving off a powerful application, and employing one, which at first would have had no effect, often does a great deal of service. When the change is made to a medicine of powers equal to those of the previous one, the benefit will be more lasting, than in the preceding circumstance.

Sir E. Home compares the principle of this occurrence, with that, by which change of air, even of a very salubrious air, for one that is less so, often produces an infinite improvement of the health.

### OF APPLICATIONS TO IRRITABLE ULCERS.

1. Sir E. Home recommends applications, in the form of vapour, as being particularly useful, by their quality of allaying irritation, and soothing pain.

The steam of warm water is productive of benefit in this way, though seldom used by itself. Its good effects are increased, when it is mixed with spirits.

Sir E. Home speaks also in favour of the benefit derived from fomentations containing opium; such as, the tincture of opium sprinkled on flannel, wrung out of hot water; or the application of flannels, wet with a warm solution of the extract of opium, or with a decoction of poppy heads. A decoction of chamomile flowers, the tops of wormwood, or hemlock leaves, may also be employed for the same purpose.

Sir E. Home points out particular irritable ulcers, however, which are rendered more painful by warm applications, and he states, that, the sores, alluded to, are generally attended with a mottled purple discoloration of the limb, for some way from them, and a coldness of the lower part of the leg, and that they are often disposed to mortify, which event is promoted by warmth.

2. As for moist applications, the poultice made of linseed meal is the most simple and most easily made, and, as it does not necessarily require any addition of oil, is to be preferred, when this disagrees with the sore.

Sir E. Home does not say much in favour of the use of the extract of lead in poultices; for, though he allows, that it often answers very well, he adds, that it also frequently disagrees with the ulcer, and, if long used, is apt to bring on the lead-colic.

A decoction of poppy-heads is said to be a very good liquor for making poultices.

The carrot-poultice is also found to agree with a great many irritable sores.

The great objection to poultices, in these cases, being the weight of such applications, the limb should always, if possible, rest upon the poultice, and not the poultice upon the limb. When the weight cannot be avoided, and is hurtful, a lighter application should be chosen.

If poultices be employed, their use is to be continued, as long as the granulations are small, and the ulcer is rapidly diminishing in size, and this even till the cicatrization is complete. When the granulations become large, and loose in their texture, poultices should be left off.

When the weight of poultices prohibits their use, Sir E. Home advises the trial of lint, dipped in one of the following lotions, and covered with a pledget of some simple ointment: a solution of the extract of opium; a decoction of poppies; the tincture of opium; a decoction of cicuta; the aqua lithargyri acetati composita; or a diluted solution of the argentum nitratum.

3. Powdered applications are generally too stimulating for irritable ulcers. Carbon has been found useful; so has powdered extract of opium, mixed with an equal quantity of carbon, or linseed flour. However, opium occasionally affects the constitution, in consequence of absorption, and it has been known to excite violent inflammation, ending in mortification.

4. Ointments are not often proper applications for irritable ulcers; as they are always, more or less, rancid, and generally disagree with the skin of persons, most subject to such diseases.

Sir E. Home mentions cream as being a very useful application, particularly in cases, in which warmth is found to do harm. The same gentleman recommends, as a substitute for it, an ointment, composed of hog's lard, purified by being repeatedly washed in spring water, and then mixed with a small quantity of white wax, and rose water.

The observations, made respecting solutions of lead, apply to the unguentum cerussæ acetatæ.

5. The pressure of bandages is generally hurtful to irritable sores, though a slight degree of it proves serviceable to certain ulcers, which are somewhat less irritable, and arise from weakness.

### OF ULCERS IN PARTS, WHOSE ACTIONS ARE TOO INDOLENT TO FORM HEALTHY GRANULATIONS, WHETHER THIS INDOLENCE ARISES FROM THE STATE OF THE PARTS, OR OF THE CONSTITUTION: THE CALLOUS ULCERS OF SEVERAL WRITERS.

Such is the next division of ulcers adopted by Sir E. Home in his treatise on the subject. The indolent ulcer forms in its appearance a complete contrast to the irritable one. The edges of the surrounding skin are thick, prominent, smooth, and rounded. The surface of the granulations is smooth and glossy. The pus, instead of being of a perfect kind, is thin and watery, being composed of a mixture of pus and coagulating lymph. The lymph consists of flakes, which cannot be easily separated from the surface of the sore. The bottom of the ulcer forms quite a level, or nearly so, and, as Sir E. Home very accurately remarks, the general aspect conveys an idea, that, a portion of the skin and parts underneath has been for some time removed, without the exposed surface having begun any new action to fill up the cavity.

When, however, the indolence of the ulcer is not so strongly marked, the sore does not correspond to the preceding description, but resembles in appearance the ulcer, which possesses an inferior degree of irritability, and can only be discriminated from it by receiving no benefit from soothing applications.

The odd circumstance of some indolent sores having the appearance of irritable ones, is, in some degree, explained by ulcers always being influenced by changes in the constitution, and accidental circumstances affecting the parts.

Most of the ulcers, which are to be seen in the London hospitals, are of the indolent kind. An indolent disposition in the ulcer may proceed altogether from the long existence of the disease, and, hence, Sir E. Home very justly observes, it is immaterial, whether at first it was healthy, weak, or irritable, for, if not cured within a certain time, it becomes indolent, with the exception of a few of the irritable kind, which never change their nature.

Indolent sores do form granulations; but, these, every now and then, are all on a sudden absorbed, and, in the course of four and twenty hours, the sore becomes as much increased in size, as it had been diminished in as many days, or weeks. This absorption of the granulations arises principally from their not being of a healthy kind; but, the event is promoted by changes in the weather, anxiety, fatigue, &c.

The object in the treatment of indolent ulcers is not simply to produce a cure, but to render such cure as permanent as possible. This can only be accomplished by altering the disposition of the granulations, and rendering them strong enough to stand their ground after the ulcer is filled up.

When an ulcer, which has existed six months, is dressed with poultices for a week, the granulations, at the end of this time, will have in part filled up the hollow of the sore, but they will present a large, loose, and glossy appearance. Should the poultice be now discontinued, and some proper stimulating application used for another week, the granulations will be found, at the expiration of this time, to have become smaller, more compact, redder, and free from the glossy appearance. The ulcer, when healed by the latter application, will not be so likely to break out again, as when healed with large, loose, flabby, glossy granulations.

Sir E. Home states, that the number of indolent sores, which heal under the use of stimulating applications, and do not break out again, compared with similar cases, treated with mild dressings, are as four to one.

### APPLICATIONS TO INDOLENT ULCERS.

1. Medicines in the form of vapour cannot heal indolent sores, so as to accomplish a lasting cure. It is only when these ulcers assume a foul appearance, and are in a temporary state of irritation, that such applications can be advantageously employed.

In general, patients on their first admission into hospitals with sore legs, have their ulcers in a temporary state of irritation from neglect, exercise, excesses, &c. Hence, it is generally found advantageous, for the first few days, or even a week, to have recourse to poultices and fomentations.

I believe, that any common fomentation, whether of chamomile, poppy-heads, or mere warm water, answers equally well. The time for using it, is while a fresh poultice is preparing, and this latter application should be changed twice a day.

2. Moist applications, such as poultices, are to be employed, when fomentations are proper, and they may be made of bread, oatmeal, or linseed.

Sir E. Home describes a species of indolent ulcers, which occur in patients of debilitated constitutions, which put on a sphacelated appearance, without any apparent cause, even after they have made some progress towards a cure, and in this way spread to a very large size. Some of these ulcers, if judged of from their appearances, would be ranked as irritable ones; but, as soothing applications do not agree with them, they are not to be classed with the latter kind of sores. They are said to occur particularly in seamen, and soldiers, who have been long at sea, and have been termed *scorbutic* ulcers. Sir E. Home represents them, however, as not being necessarily connected with the scurvy, and being often met with in patients, who have not been on the sea. This gentleman states, that these ulcers are not of necessity joined with any specific disease; but are common to all kinds of patients, whose constitutions have been impaired, either by salt provisions, warm climates, or drinking.

From some trials, first made by Dr. Harness, and afterwards by Sir E. Home, it appears, that these particular ulcers, when in a sphacelated state, are benefited by employing the gastric juice of ruminating animals, as an external application. It makes the sloughs fall off, and the sore assume a better appearance. Some pain follows on its being first applied, and it is to be regarded as a stimulating application.

Sir E. Home mentions, that in the West Indies, such ulcers are advantageously dressed with the fresh root of the cassada, grated into a pulp. Lime-juice has also been found a useful application, and solutions of vitriol and alum have been recommended.

When indolent ulcers are not attended with certain peculiarities, a solution of the argentum nitratum is one of the best of the watery applications. It stimulates the granulations, and makes them put on a more healthy appearance, and its strength may be increased according to circumstances. An ulcer, which at first cannot bear this solution above a certain strength, without pain, and without the granulations being absorbed, becomes able, after the application has been used, about ten days, or a fortnight, to bear it twice as strong, without such effects being produced: a proof of the granulations having acquired strength.

The tincture of myrrh is often employed as an application to indolent ulcers. Hunezowsky has praised a decoction of the walnut-tree leaves, and soft covering of the walnut, for the same purpose. (*Acta Acad. Med. Chir. Vindob. Tom.* 1. 1788.) Sir E. Home gives his testimony in favour of both the latter dressings.

The diluted vitriolic acid, and the expressed juice of the pod of different species of pepper in a recent state, are mentioned by Sir E. Home as having been used as applications to indolent ulcers: the latter one in the West Indies.

This gentleman recommends also a scruple of nitrous acid, mixed with eight ounces of water, as a very useful medicine for external use. The strength must be increased or diminished, according to circumstances. Sir E. Home has found, that this application promotes, in a very uncommon manner, the progress of the cure.

The first application of diluted nitrous acid gives a good deal of pain, which lasts about half an hour, and then goes off.

When an indolent ulcer heals with the diluted nitrous acid, the process of skinning is accomplished with more rapidity, than when other applications are employed; and the new skin is said to be more completely formed. The acid coagulates the pus as soon as it is secreted.

Sir E. Home states, that several patients, who had ulcers dressed with the diluted nitrous acid, were allowed to walk about, without finding the progress of the cure retarded, although no bandage to support the limb was made use of. This gentleman informs us, also, that in ulcers of the leg, attended with an exposure of a piece of bone, which retards the cure, because it does not exfoliate, and come away, the application of diluted nitrous acid to the bone removes the earthy part, and excites the absorbents to act upon the remaining animal portion.

3. The only application, in the form of powder, adapted to indolent ulcers, is, according to Sir E. Home, the hydrargyrus nitratus ruber. It is only to be occasionally used for ulcers of the most indolent kind.

4. Ointments are represented as being particularly proper applications for the sores under consideration.

The idea of the air having bad effects on ulcers exposed to it, is now disbelieved. That air has no irritating property of this kind, is proved by the fact, that, when the abdomen of an animal is filled with it, no inflammation is excited. When the cellular membrane is loaded with it, in cases of emphysema, the parts do not afterwards inflame. Nor do ulcers in the throat, as Sir E. Home justly remarks, heal less favourably than others, although they are of necessity always exposed to the air.

Whatever ill effects arise, may probably be explained by the consequences of evaporation, which converts the soft pus into a scab. The granulations are, in all probability, most favourably circumstanced, when they are covered with their own matter, which should only be now and then removed, in order that such applications may be made, as will stimulate them to secrete a more perfect pus. From what has been just stated, it must be obvious, that indolent ulcers should not be frequently dressed, and, that if they are so, and the dressings are stimulating, the practice will do harm. Changing the dressings once in twenty-four hours is deemed quite sufficient, unless the quantity of matter is very great, which very seldom happens in these cases.

One part of the unguentum hydrargyri nitrati mixed with three of hog's lard, is one of the best applications. Its strength, however, must be increased after being used, for some time, as a dressing for the same ulcer.

The unguentum hydrargyri nitrati has the effect of quickly removing the thickening of the edges of indolent ulcers, and the surrounding dark red colour of the skin. It seems also to have particularly great power in making the granulations become small and healthy, and, of course, the ulcer is less likely to break out again.

With some ulcers, however, this ointment is found to disagree.

The unguentum resinæ flavæ, and the unguentum elemi, mixed with the balsam of turpentine, or that of copaiba, are other common applications to indolent sores. Sir E. Home states, that the resins and turpentines are not so powerful, as the acids and metallic salts, in giving the granulations a healthy appearance, and a disposition to resist being absorbed.

Cases, attended with a degree of indolent thickening, are such as are most likely to be improved, by camphorated ointments.

In numerous cases, the applications, whatever they are, soon lose their effect, and others should then be substituted for them. The past and present states of the sore are always to be considered. Although the ulcer may be in its nature indolent, it is liable to temporary changes, from constitutional causes, and hence, a temporary alteration in the treatment becomes proper.

5. Bandages are undoubtedly of the most essential service in healing many kinds of ulcers: but, their efficacy is so great in curing numerous indolent sores, that they are considered by some as the principal means of cure.

Among the advocates for the employment of the roller, Mr. Whately is one of the most zealous. The following extracts will convey to the reader a tolerably good idea of this gentleman's opinions.

"The efficacy of *pressure* in counteracting the effects of the dependant posture, was indeed known to the father of English surgery; and the use of the laced stocking was recommended by him for this purpose; nor can there be any doubt, that, the good effects of it, in his hands, were very manifest. His ideas, however, seem not to have been much regarded by succeeding surgeons. We find but little said by the writers on surgery, on the effects of pressure in the cure of ulcers on the lower extremities, previous to the appearance of Dr. Underwood's treatise. Yet I am aware, that there always have been practitioners, who were acquainted with the importance of this mode of treatment, and have adopted it in their practice. I had, myself, an opportunity of seeing the extraordinary success attending it, during my apprenticeship in the country. It is matter of fact, however, that the practice is very far from being general. Even in one of the latest publications on the subject, and this too by a surgeon of the first eminence, the effect of pressure is not much relied upon for the cure of these complaints. It is, indeed, there stated, in several passages, not only that no benefit is derived from compression in several species of these ulcers, but that many ulcers are rendered worse, more painful, and more unhealthy in their appearance by its use (as observed in Sir Everard Home's Remarks on Ulcers of the Legs.) That there are certain conditions of an ulcer, which will not bear compression, I have allowed, and have endeavoured to point out the proper treatment, to bring on a fit state for the application of that pressure: but that an experienced surgeon should pass over so slightly this most essential part of the cure, and even speak of it as *frequently* injurious, is a circumstance hardly to be attributed to any other cause than that of a careless and ineffectual application of the bandages. For my own part, having now been for twenty years constantly in the habit of treating a very large number of these cases, I can speak so confidently of the good effects of pressure, properly applied, that I can venture to affirm, that he who doubts its efficacy, has never given it a fair trial.

"In the cases which are added to this essay, (says Mr. Whately) very little variety of dressing was used; the cure was almost always trusted principally to the pressure made on the limb, under the exceptions particularly specified in the work. My success has been so uniform, that I cannot but be anxious to see this practice become established and generally followed. Nothing but a conviction, that in promoting this end, I am really doing an important service to my fellow-creatures, could have induced me to appear before the tribunal of the public, conscious as I am of my incompetency as a writer. But may I not hope, that the plain tale of a practical man will be heard, though not told with the graces of elegant language?

"In whatever manner this attempt be received, I cannot doubt but that the practice here recommended must, in the end, prevail, notwithstanding it has this great obstacle to contend with, that surgeons must condescend, for the most part, to apply the bandages with their own hands. The clumsy and ineffectual manner, in which this business is too frequently done, can never be expected to produce the desired effect. I am certain, that if the necessary pains be taken, according to the directions here laid down, such effects will uniformly follow, as must convince the unprejudiced mind, that to have recourse to the operation of tying varicose veins, and the application of a great variety of remedies, can be *very rarely*, most probably *never* necessary. I can safely declare, that all such cases, as are described by Sir E. Home to be cured by this operation, have readily yielded, under the proper management of pressure alone.

"Since these papers were preparing for the press, I have seen with pleasure Mr. Baynton's new method of treating these complaints. Every thing that is there said on the efficacy of his method, may be considered as confirming the doctrine laid down in the following pages. His mode, however, of making the pressure with adhesive plaster, appears to me inconvenient, and on several accounts objectionable. I have no doubt but that the proper application of compresses and flannel rollers, would, in every case recorded by him, have produced similar good effects. The instances of success by this method, after the supposed failure by the roller, I can only attribute to this, that the pressure made with the plasters was applied by his own hands, whereas that with the roller, was probably, as is usual, so made, that the effect intended by it could not possibly have been obtained. No surgeon, who will not be at the trouble of applying them himself, can be a judge of what may be effected, by the proper management of the roller and compresses."

The following is the calamine cerate, which Mr. Whately has usually employed:

℞. Axung. Porcin. depur. lib. iij.
Empl. Lithargyr. lib. iss.
Lap. Calam. præp. ap. lib. j. M.

"To this formula (says Mr. Whately,) I shall add another for making a cerate, which nearly resembles the unguentum tripharmicum of the old Dispensatory, but being less oily, it makes a much more adhesive plaster. It should be spread on rag, or silk, as an external covering to the dressing on lint, where a tow plaster cannot be conveniently used; as in wounds of the face or hands, a bubo, or any other sore, where an external plaster cannot be readily retained in its situation by a bandage. This plaster is likewise so mild, that it never irritates the skin. I have found it also a very useful plaster in fractures. The following is the formula:

℞. Empl. Litharg. lib. j.
Axung. Porcin. depur. unc. vj.
Aceti unc. iv. M."

With respect to the proper method of applying the roller and compresses, Mr. Whately offers the following remarks:

"I have said, that the flannel rollers should be four inches wide, to allow for shrinking in washing; by which I would have it understood, that when they are made of that width, they are a little too wide: especially for those whose legs are small. The best width for a flannel roller, designed for those who have slender legs, is three inches; but for those, whose legs are of a large size, they should always be three inches and a half in width. They must therefore be at first torn a little wider, that they may be of their proper width when repeatedly washed. It will likewise be found, that rollers made of fine, soft, and open flannel, will answer much better, than those made of coarse or hard flannel.

"For those who have full sized legs, the length of six yards is but just sufficient to answer all the purposes intended by a roller; but in those who have very small legs, five yards is a sufficient length. Care should be taken that the rollers be washed in very hot water, and they should be hung up to dry immediately on being washed. If these precautions be not attended to, repeated washing them will, in some kinds of flannel, make them as narrow as tape, by which they will be rendered almost useless. They should be often washed, as they are much softer, and of course sit easier, when quite clean, than when they are soiled.

"In applying a roller, (says this gentleman,) the first circle should be made *round* the *lowest* part of the ankle, as near as possible to the heel; the second should be formed from thence round the foot; the third should be passed again round the foot quite to the toes. The roller should then be passed from the foot round the ankle and instep a second time to make the fourth circle. In doing this, it should be brought nearer (but not over) the point of the heel than it was at the *first time* of going round this part. The fifth circle should pass over the ankles again, and not more than half an inch higher up the leg than the fourth circle. The sixth, seventh, eighth, and ninth circles should ascend spirally along the small of the leg, at the *exact distance* of three-fourths of an inch from each other. Having proceeded thus far up the leg, we may begin to increase the distances of the circles from each other; they may succeed each other upward to the knee at the distance of from one to two inches, according to the size and shape of the leg. At that part where the calf of the leg commences, it is generally necessary to let the upper edge of the roller be once, twice, or thrice, turned downwards for about half the circumference of the leg, in order to make the roller lay smooth between the middle of the calf, and the small of the leg. When the roller has been thus applied as far as the knee, there will be a portion of it to spare, of perhaps a yard in length; this remainder should be brought down by spiral windings, at greater distances from each other than those which were made on the ascent of the roller. The windings should in general be completed in the small of the leg, where the roller should be pinned.

"In *many* cases, it is necessary to apply the roller *over* the *heel.* It should be brought as low as possible round the ankle; as in the former description. From thence, the second circle of the roller should pass from the instep over one side of the heel, and be brought over the other side of the heel to the instep again. The third circle should be passed round the ankle a second time, but still nearer to the heel than the first circle was. The roller should after this be brought back to the foot, and passed round it to make the fourth circle. A fifth circle should be again made (though it is not in all cases absolutely necessary) round the foot, to the toes. To make the sixth circle, the roller should be brought back, and passed round the ankle again. The seventh, eighth, ninth, tenth, and eleventh circles should ascend spirally at the *exact distance* of three-fourths of an inch from each other; these distances commencing at the sixth circle. The roller should then be carried to the knee, and be brought down again to the small of the leg, as described in the former instruction.

"In applying the compresses, it is necessary in every instance to put them on one by one, and not all in a mass, though they be of a proper size and number. They should be crossed in different directions; the largest of them should in no case be longer than just to meet on the opposite side of the leg, to which they are applied. I have in many instances seen the compresses applied by the patients of such a length as to go round the leg like a roller, and be fastened together with pins. This method generally wrinkles and blisters the skin, and by no means answers the purpose of making a compression on the part where it is most wanted. I never suffer a pin to be used in the compresses. If the same compresses in any case be applied two days together, they should always be turned on the contrary side at each re-application, in order to prevent wrinkles on the skin."

Mr. Whately notices two objections made by Mr. Baynton to rollers. "The first is, that it is difficult to retain the roller on the parts to which it is applied; the second is, that it gives pain to the patient." Mr. Whately's experience, however, warrants him in saying, that a flannel roller will, in almost every instance, keep the exact position it was first placed in, for a much longer time than is necessary. "I have seen these rollers (says Mr. Whately) many hundred times keep their situations without any variation whatever for two days; and that too without the least restraint upon exercise. This has happened in those cases, where from the distance of the patient, or from the circumstance of his being nearly cured, I have wished to dress the leg only every forty-eight hours. I must go a step further, and observe, that I have seen repeated instances in which these rollers have remained in their situation for three or four days, and even nearly for a week without being applied afresh. In short, it is one of the best properties of a flannel roller, that it is easily retained in its situation, when well applied. In *every* instance, in which it is necessary to use one, I could pledge myself to apply it in such a manner, as should prevent its altering its position for two days. The method I should use, I have already described; in addition to which, nothing more would be necessary, even in those cases where the shape of the leg is peculiarly unfavourable to the retention of a bandage, than the insertion of a few pins.

"In answer to the second objection, I observe, that I have invariably found, that when a flannel roller has been applied in the manner here described, and has not been drawn unnecessarily tight, it gives no pain. It sits nearly as easy as a common stocking, and allows a very free motion and exercise of the limb. It has been stated in this work, that the application of the compresses makes the necessary degree of pressure on the ulcer, and thereby prevents the necessity of drawing the roller so tight over the other parts of the leg, as would have been necessary were the compresses not used.

"There is another circumstance which Mr. Baynton considers as giving his method a great advantage over the roller, which is, that by means of the plaster, the edges of the sore may be made to approximate in such a manner, that the cicatrix, or new-formed skin, will be less after a cure performed by this method than by any other. In almost all these cases, before the cure is attempted, the leg is more or less enlarged by swelling; and as this swelling is entirely removed by compression, it readily allows the skin to approximate on the healing of an ulcer. Added to this, there is a process in nature always going on in healing an ulcer or wound in any part of the body, (whether there be a loss of substance or not,) by which a cicatrix is always considerably less than the previous size of the sore. This effect occurs in all cases, whether the patient be cured by the horizontal position, a roller, or by strips of adhesive plaster. The size of this cicatrix will likewise vary in different cases where the ulcers have been of the same size, by whichever of these three methods they be cured. It will be larger in those ulcers which are accompanied with strong adhesions of the adjoining parts, than in those where such adhesions have not been produced; and this effect will take place to the greatest degree where the ulcers are situated over the tibia, and by long continuance have produced immoveable adhesions of the cellular substance to the adjoining periosteum. The adhesive plaster, when applied as a bandage, will without doubt leave as small a cicatrix as any other method of cure; but, for the reasons already assigned, I do not believe that the cicatrix will in any case be *smaller* than that produced by a roller. In every case cured by the latter method, I have found the cicatrix very small, when compared with the previous size of the ulcer."—(See *Practical Observations on the Cure of Wounds and Ulcers on the Legs, without Rest; by Thomas Whately*, 1799.)

6. We shall next introduce an account of Mr. Baynton's plan of curing old ulcers of the leg, by means of adhesive plaster. Were I to say, that any particular method of dressing such sores is entitled to superior praise, I should certainly decide in favour of this gentleman's practice. I have seen it most successful myself, and I hear it highly spoken of by numerous professional friends, in whose unprejudiced judgment I place much reliance.

Mr. Baynton acquaints us, that the means proposed by him will, in most instances, be found sufficient to accomplish cures in the worst cases, without pain or confinement. After having been repeatedly disappointed in the cure of old ulcers, Mr. Baynton determined on *bringing the edges of old ulcers nearer together by means of slips of adhesive plasters.* To this he was chiefly led, from having frequently observed, that the probability of an ulcer continuing sound, depended much on the size of the cicatrix, which remained after the cure appeared to be accomplished; and from well knowing, that the true skin was a much more substantial support and defence, as well as a better covering, than the frail one, which is obtained by the assistance of art. But, when he had recourse to the adhesive plaster, with a view to lessen the probability of those ulcers breaking out again, he little expected, that an application so simple would prove the easiest, most efficacious, and most agreeable means of treating ulcers.

Although the first cases, in which Mr. Baynton tried this practice, were of an unfavourable nature, yet he had soon the satisfaction to perceive that it occasioned very little pain, and materially accelerated the cure, while the size of the cicatrices were much less than they would have been, had the cures been obtained by any of the common methods.

At first, however, the success was not quite perfect; as, in many instances, he was not able to remove the slips of plaster, without removing some portion of the adjacent skin, which, by occasioning a new wound, proved a disagreeable circumstance, in a part so disposed to inflame and ulcerate, as that in the vicinity of an old sore. He therefore endeavoured to obviate that inconvenience by keeping the plasters and bandages well moistened with spring-water, for some time, before they were removed from the limb. He had soon the satisfaction to observe, that the inconvenience was not only prevented, but that every succeeding case justified the confidence he now began to place in the remedy. He also discovered, that moistening the bandages was attended with advantages which he did not expect: while the parts were wet and cool, the patients were much more comfortable in their sensations, and the surrounding inflammation was sooner removed, than he had before observed it to be.

By the mode of treatment here recommended, Mr. Baynton found, that the discharge was lessened, the offensive smell removed, and the pain abated in a very short time. But, besides these advantages, he also found, that the callous edges were in a few days level with the surface of the sore; that the growth of fungus was prevented, and the necessity of applying painful escharotics much lessened, if not entirely done away. Mr. Baynton gives the following description of his method.

" The parts should be first cleared of the hair, sometimes found in considerable quantities upon the legs, by means of a razor, that none of the discharges, by being retained, may become acrid, and inflame the skin, and that the dressings may be removed with ease at each time of their renewal, which, in some cases, where the discharges are very profuse, and the ulcers very irritable, may, perhaps, be necessary twice in the twenty-four hours, but which I have, in every instance, been only under the necessity of performing once in that space of time.

" The plaster should be prepared by slowly melting, in an iron ladle, a sufficient quantity of litharge plaster, or diachylon, which if too brittle, when cold, to adhere, may be rendered adhesive by melting half a drachm of resin with every ounce of the plaster: when melted, it should be stirred till it begins to cool, and then spread thinly upon slips of smooth porous calico, of a convenient length and breadth, by sweeping it quickly from the end, held by the left hand of the person who spreads it, to the other, held firmly by another person, with the common elastic spatula used by apothecaries; the uneven edges must be taken off, and the pieces cut into slips, about two inches in breadth, and of a length that will, after being passed round the limb, leave an end of about four or five inches. The middle of the piece so prepared, is to be applied to the sound part of the limb, opposite to the inferior part of the ulcer, so that the lower edge of the plaster may be placed about an inch below the lower edge of the sore, and the ends drawn over the ulcer with as much gradual extension as the patient can well bear; other slips are to be secured in the same way, each above and in contact with the other, until the whole surface of the sore and the limb are completely covered, at least one inch below and two or three above the diseased part.

" The whole of the leg should then be equally defended with pieces of soft calico, three or four times doubled, and a bandage of the same, about three inches in breadth, and four or five yards in length, or rather, as much as will be sufficient to support the limb from the toes to the knee, should be applied as smoothly as can be possibly performed by the surgeon, and with as much firmness as can be borne by the patient, being first passed round the leg, at the ankle joint, then as many times round the foot as will cover and support every part of it, except the toes, and afterwards up the limb till it reaches the knee, observing that each turn of the bandage should have its lower edge so placed as to be about an inch above the lower edge of the fold next below.

" If the parts be much inflamed, or the discharge very profuse, they should be well moistened, and kept cool with cold spring-water poured upon them as often as the heat may indicate to be necessary, or, perhaps, at least, once every hour. The patient may take what exercise he pleases, and it will be always found, that an alleviation of his pain and the promotion of his cure will follow as its consequence, though, under other modes of treating the disease, it aggravates the pain, and prevents the cure.

" These means, when it can be made convenient, should be applied soon after rising in the morning, as the legs of persons affected with this disease are then found most free from tumefaction, and the advantages will be greater than when they are applied to limbs, in a swollen state. But at whatever time the applications be made, or in whatever condition the parts be found, I believe it will always happen, that cures may be obtained by these means alone, except in one species of the disease, which seldom occurs, but that will hereafter be described. The first application will sometimes occasion pain, which, however, subsides in a short time, and is felt less sensibly at every succeeding dressing. The force, with which the ends are drawn over the limb, must then be gradually increased, and when the parts are restored to their natural state of ease and sensibility, which will soon happen, as much may be applied as the calico will bear, or the surgeon can exert; especially if the limb be in that enlarged and incompressible state, which has been denominated the scorbutic, or if the edges of the wound be widely separated from each other."

Mr. Baynton afterwards takes notice of the breaking of the skin, near the ulcers; a circumstance, which sometimes proved troublesome, and arose partly from the mechanical effect of the adhesive plasters, and partly from the irritating quality of the plaster. Mr. Baynton, however, only considers such sores of serious consequence, when they are situated over the tendon of Achilles, in which situation they are sometimes several weeks in getting well. This gentleman recommends, with a view of preventing these ulcers, a small shred of soft leather to be put under the adhesive plaster.

Mr. Baynton next adds, "that cures will be generally obtained without difficulty, by the mere application of the slips and bandage; but, when the parts are much inflamed, and the secretions great, or the season hot, the frequent application of cold water will be found a valuable auxiliary, and may be always safely had recourse to, where the heat of the part is greater, than is natural, and the body free from perspiration." (See *A Descriptive Account of a New Method of Treating Old Ulcers of the Legs, by Thomas Baynton, Surgeon at Bristol. Edit.* 2. 1799.)

One circumstance, strongly in favour of the advantages of the foregoing mode of treatment, deserves particular notice: when M. Roux lately visited the London hospitals, he had for the first time an opportunity of seeing this practice, which had never been tried in France. The plan appeared to him so different from every thing which he had been accustomed to see in his own country, where ulcers were almost always treated by rest in an horizontal posture, and emollient applications, that he left London somewhat prejudiced against the new method. Subsequently to his return to Paris, however, he has given it a fair trial, and experience has now entirely changed his opinion, as he has had the candour to acknowledge. (See *Rélation d'un Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise par P. J. Roux, p.* 150.)

### OF ULCERS ATTENDED WITH SOME SPECIFIC DISEASED ACTION, EITHER CONSTITUTIONAL, OR LOCAL.

#### 1. *Ulcers which yield to Mercury.*

Here we shall exclude from consideration venereal ulcers, as this subject is treated of in the article *Venereal Disease.* At present, we shall only notice such sores, as are produced by other diseases of the general system, or of the parts, and are capable of being cured by mercury.

Perhaps, there is no greater source of error in the whole practice of surgery, than the supposition, that a sore, when it yields to mercury, must be of a syphilitic nature. Surgeons, however, who run into this absurdity, can hardly be imagined to be unaware, that so potent a medicine must have effects on numerous diseases of very different descriptions. Sir E. Home accurately remarks, that many ulcers, unconnected with the venereal disease, which receive no benefit from other medicines, heal under a mercurial course, or yield to mercurial applications. In some cases, the ulcer remains in the same state, while mercury is used; but, begins to look better, as soon as the medicine is discontinued, in consequence of the beneficial change, produced in the system by the mercurial course. In these cases, mercurial frictions are the best, because they occasion least impairment of the constitution, in consequence of the stomach continuing undisturbed, and capable of digesting well.

Another description of ulcers, noticed by Sir E. Home, as deriving benefit from mercury, occur on the instep and foot, have a very thickened edge, and are attended with a diseased state of the surrounding skin, so as to bear some resemblance to elephantiasis. They are frequently observed affecting servants, who live in opulent families, in an indolent and luxurious way. Sir E. Home states, that fumigations with the hydrargyrus sulphuratus ruber heal these ulcers, and resolve in a great degree the swelling of the surrounding parts. In some instances, an ointment of calomel and hog's lard; in others, the camphorated weak mercurial ointment, is the best application.

Many diseased ulcers, particularly those of a superficial kind, with a thickened edge, may be healed, when they are dressed with a solution of one grain of the hydrargyrus muriatus, in an ounce of water, containing a little spirit.

#### 2. *Ulcers, which are curable by Hemlock.*

Sir E. Home places more reliance on hemlock, as an external, than an internal remedy, for ulcers. The ulcers, which usually receive benefit from hemlock applications, look like those of an irritable sort; but, the surrounding parts are thickened, in consequence of some diseased action. Such sores occur near the ankle; which joint is at the same time enlarged. Sometimes, but not so often, they take place over the ligaments of the knee. On account of their situation, and the swelling of the joint, they may be suspected to be scrophulous, though they are more sensible, than strumous ulcers usually are. The sores, just described, are rendered less painful, their diseased disposition is checked, and the swelling of the joint diminished, by hemlock. Several irritable scrophulous ulcers are also particularly benefited by this medicine.

Sir E. Home gives the preference to hemlock poultices, unless their weight should be objectionable, in which cases, he advises lint to be dipped in a decoction of the herb, and put on the sore.

Of the ointment, made with the inspissated juice, Sir E. Home says but little, in regard to its efficacy.

### 3. *Ulcers which may be cured by Salt Water.*

Sir E. Home takes notice of other specific ulcers, which yield to this application, after resisting other remedies. Poultices, made with sea-water, are often employed; but, this gentleman seems to prefer keeping the part immersed in the water in a tepid state, about a quarter of an hour, twice a day.

When sea-water poultices bring out pimples, in cases of scrophulous ulcers on the legs and feet, Sir E. Home informs us, that this disagreeable circumstance may be obviated by diluting such water with an equal quantity of a decoction of poppies. After a time, the salt water may be tried by itself again. While each fresh poultice is preparing, the part should also be immersed in such water warmed.

When there is a tendency to anasarca, or when there is an unusual coldness in the limb, unattended with any propensity to mortification, tepid salt-water may be used with infinite advantage.

### 4. *Ulcers, which may be cured by the Argentum Nitratum.*

Sir E. Home notices, under this head, an ulcer, which does not penetrate more deeply, than the cutis; but, spreads in all directions, producing ulceration on the surface of the skin, and often extending nearly through its whole thickness. The part, first affected, heals, while the skin beyond is in a state of ulceration.

Of this description are, a leprous eruption, mostly seen in men impressed in Ireland; a disease of the skin induced by buboes, which have continued a great while after the venereal virus has been destroyed; and the ring-worm.

All these diseases are most easily cured by applying to them a solution of the argentum nitratum.

The leprous eruption is communicated by contact, and makes its appearance in the form of a boil. This is converted into an ulcer, which discharges a fetid fluid, by which the surrounding skin is excoriated, and the ulceration is extended over a large surface. The pain is the most severe, and the discharge greatest, in hot weather. The parts first diseased heal, while others are becoming ulcerated, and the disease is always rendered worse, by spirituous liquors, salt provisions, and catching cold.

Sir E. Home remarks, that the disease in the skin, produced by the effects of very irritable buboes, in constitutions broken down by mercury, is attended with ulceration of a more violent, deep, and painful kind, than the foregoing distemper. The progress of this disorder is, in other respects, very similar to that of the leprous eruption.

Although the ringworm only occurs in the form of an ulcer in warm climates, a mild species of the affection takes place in summer-time in this country. It seems to be infectious; though it often occurs without infection. It commences with an efflorescence, which is attended with very trivial swelling, and spreads from a central point. The circumference of the efflorescence becomes raised into a welt, while the rest assumes a scurfy appearance. The welt becomes covered with a scab, which falls off, and leaves an ulcerated ring, in general, not more than a quarter of an inch wide. The outer margin of this ring continues to ulcerate, while the inner one heals, so that the circle gets larger and larger. The discharge consists of a thin, acrid fluid, which seems to have a great share in making the disease spread.

For all the three preceding diseases, a solution of the argentum nitratum is strongly recommended by Sir E. Home.

### 5. *Ulcers, which yield to Arsenic.*

The sores, which are named *noli me tangere*, derive great benefit from this powerful remedy. Sir E. Home observes, that they are nearly allied to cancer, differing from it in not contaminating the neighbouring parts by absorption, and only spreading by immediate contact.

From some cases, which fell under Sir E. Home's observation, he discovered, that arsenic was not only efficacious as an external, but also as an internal remedy. I shall not unnecessarily enlarge upon this subject in the present place, as the reader may refer to the articles *Arsenic, Cancer,* and *Noli Me Tangere*, for additional information, relative to the uses of this potent mineral in the practice of surgery.

Sir E. Home is an advocate for its employment, both internally and externally, for ulcers of untoward appearance on the legs. The *fungated* ulcer is particularly pointed out by this gentleman as being benefited by arsenic. This ulcer occurs on the calf of the leg, and on the sole of the foot. From its surface, a fungus shoots out, which is entirely different from common granulations. The new formed substance is radiated in its structure, the bottom of the ulcer being the central point, and the external surface, which is continually increasing, the circumference. The substance of this fungus is very tender, and readily bleeds. The first stage of the disease sometimes has the appearance of a scrophulous affection of the metatarsal bones; but, the parts seem more enlarged, and, when the skin ulcerates, a fungus shoots out, and betrays the nature of the case.

One species of the fungated ulcer is capable of contaminating the lymphatic glands; the other is not so. The first is represented by Sir E. Home as being incurable by arsenic, or any other known medicine.

The second yields to this remedy. Sir E. Home uses a saturated solution, made by boiling white arsenic in water, for several hours, in a sand heat. He gives from three to ten drops internally; and, for outward use, dilutes a dram with two pints of water, making it afterwards gradually stronger and stronger, till it is of double strength. The application may either be made in the form of a poultice, or by dipping lint in the lotion.

The best and safest preparation of arsenic, both for internal and external use, is the kali arsenicatum. The mode of employing it may be learnt by turning to the articles *Arsenic*, *Aqua Kali Arsenicati*, *Noli Me Tangere*, &c.

### 6. *Ulcers attended with Varicose Veins.*

A certain kind of ulcer is very apt to occur on the inside of the leg, and is equally difficult to cure, and liable to break out again. It has the look of a mild, indolent sore; but, the branches and trunk of the vena saphena are enlarged, and this varix of the veins keeps the ulcer from healing. The sore is seldom deep, usually spreads along the surface, and has an oval shape, the ends of which are vertically situated. There is a pain affecting the limb rather deeply, extending up in the course of the veins, and exasperated by keeping the leg a long while in an erect posture.

This is a kind of ulcer, which derives immense benefit from a tight roller, applied from the toes to the knee, although the direct operation of the pressure of the bandage on the sore is itself productive of no particular good.

Sir E. Home found, however, that many patients could not bear to wear laced stockings, or tight bandages, and that others received no relief from them. Hence, this gentleman was led to consider what else could be done for the cure of the varicose state of the veins. He represents, that, in consequence of the size of the vena saphena, and its numberless convolutions, the return of blood from the smaller branches is so impeded, as to retard the circulation in the smaller arteries, and to interfere with their action in forming healthy granulations. The coats, and valves of the veins also become thickened, so that the latter parts (the valves) do not do their office of supporting the weight of the column of blood.

These reflections induced Sir E. Home to think, that some benefit might be obtained by taking off a part of the pressure of this column of blood, by making a ligature round the vena saphena, where this vessel passes over the knee-joint. Thus the cavity of the vein at this part would be obliterated, and a kind of artificial valve would be formed.

This gentleman recommends the following way of performing the operation: "As the veins are only turgid in the erect posture, the operation should be performed while the patient is standing; and if placed upon a table, on which there is a chair, the back of the chair will serve him to rest upon; and he will have the knee-joint at a very convenient height for the surgeon. The leg to be operated upon must stand with the inner ankle facing the light, which will expose very advantageously the enlarged vena saphena passing over the knee-joint. While the patient is in this posture, if a fold of the skin, which is very loose at this part, is pinched up transversely, and kept in that position by the finger and thumb of the surgeon, on one side, and of an assistant on the other, this fold may be divided by a pointed scalpel, pushed through with the back of the knife towards the limb to prevent the vein being wounded; much in the same way, as the skin is divided in making an issue. This will expose the vein sufficiently; but, there is commonly a thin membranous fascia confining it in its situation; and, when that is met with, the vein had better be laterally disengaged by the point of the knife. This is most expeditiously done by laying hold of the fascia with a pair of dissecting forceps, and dividing it; for it is difficult to cut upon parts, which give little resistance, and there is a risk of wounding the vein. After this a silver crooked needle, with the point rounded off, will readily force its way through the cellular membrane connected with the vein, without any danger of wounding the vessel, and carry a ligature round it. This part, or, indeed, what may be considered as the whole of the operation, being finished, the patient had better be put to bed, so as to allow the vein to be in its easiest state, before the ligature is tied, and then a knot is to be made upon the vein: this gives some pain; but, it is by no means severe. The edges of the wound in the skin are now to be brought together by sticking plaster, except where the ligature passes out, and a compress and bandage applied, so as to keep up a moderate degree of pressure on the veins, both above and below the part included in the ligature." (*Home on Ulcers, p.* 296. *edit.* 2.)

It appears that A. Paré proposed and performed an operation, similar to that described by Sir E. Home. (See *A. Paré's Works, translated by Johnson; folio edition, Page* 319.) An account of Mr. Brodie's operation for the cure of varicose veins, and some additional remarks on the treatment of ulcers accompanied with varices, will be found in a subsequent article. See *Varicose Veins.* A description of, what has sometimes been called the *hospital sore*, is given under the head of *Hospital Gangrene.*

For information on the subject of ulcers, consult *Underwood's Surgical Tracts on Ulcers, &c.*1799; *B. Bell's System of Surgery; Baynton's Descriptive Account of a new Method of Treating Old Ulcers of the Legs,* 1799, *edit.* 2; *Whately's Practical Observations on the Cure of Wounds and Ulcers on the Legs, without Rest,* 1799; *Practical Observations on the Treatment of Ulcers on the Legs, to which are added, some Observations on Varicose Veins and Piles, by Sir Everard Home, F. R. S.* 1801, *edit.* 2.; *Principles of Surgery, by John Bell, Vol.* 1. 1801; *Hunter on the Blood, Inflammation, &c. Brodie's Observations on the Treatment of Varicose Veins of the Legs, in Medico-Chirurgical Trans. Vol.* 7, *P.* 195, *&c. Richerand, Nosographie Chirurgicale, Tom.* 1, *p.* 121, *&c. Edit.* 4. *Boyer, Traité des Maladies Chir. Tom.* 2, *p.* 365, *&c. Paris,* 1814. *Roux, Voyage fait à Londres en* 1814, *ou Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p.* 142, *&c. Paris,* 1815. *Dr. John Thomson's Lectures on Inflammation, p.* 423, *&c. Edinb.* 1813. *Dr. Dewar on the Treatment of Sinuous Ulcers, in Medico-Chirurgical Trans. Vol.* 7, *p.* 482, *&c. The stages of several cutaneous affections, attended with ulceration, have been excellently described by Dr. Bateman in his valuable Synopsis of Cutaneous Diseases.*

**UNGUENTUM ACIDI SULPHURICI.**—℞. Acidi Sulphurici ʒj. Adipis Suillæ præparatæ ℥j.—These are to be well mixed together in a glass mortar.

This ointment is said to have been used by Dr. Duncan, of Edinburgh, for curing the itch. It has the character also of being efficacious in the reduction of some chronic swellings of the joints. Mr. Naylor, of Gloucester, has employed frictions with this ointment, containing a good deal of camphor, for the purpose of reducing the swelling of the thyroid gland, in cases of bronchocele.

As the sulphuric acid is particularly detructive of vegetable substances, the parts, to which this ointment is applied, should always be covered with flannel, instead of linen.

**UNGUENTUM CANTHARIDIS** vel *Lyttæ.*—℞. Cantharid. Pulv. ℥ij. Aquæ Distillatæ ℥viij. Unguenti Resinæ Flavæ ℥viij. Boil the water with the cantharides, till one half of the fluid has evaporated. Then strain the rest, to which add the ointment of yellow resin. Evaporate the mixture in a water bath, saturated with sea-salt, until it is of the consistence of an ointment.

**UNGUENTUM CETACEI.**—℞. Cetacei ʒvj. Ceræ Albæ ʒij. Olivæ Olei. fluid uncias tres. These are to be melted upon a slow fire, and then briskly stirred till cold.—This ointment, spread on lint, serves as a simple dressing for wounds, ulcers, &c.

**UNGUENTUM CERÆ CUM ACETO.**—℞. Ceræ Albæ ℥iv. Olei Olivæ ℔j. Aceti Distillati ℥ij. The vinegar is to be gradually mixed with the two first ingredients, after these have been melted together. Dr. Cheston recommends this ointment for superficial excoriations, cutaneous eruptions, &c.

**UNGUENTUM CONII.**—℞. Foliorum Conii recentium. Adipis Suillæ præparatæ, sing. ℥iv. The hemlock is to be bruised in a marble mortar, after which, the lard is to be added, and the two ingredients thoroughly incorporated by beating. They are then to be gently melted over the fire, and after being strained through a cloth, and the fibrous part of the hemlock well pressed, the ointment is to be stirred till quite cold. To cancerous or scrophulous sores, this ointment may be applied with a prospect of advantage. (*Pharm. Chirurg.*)

The Pharmacopœia of St. Bartholomew's Hospital directs the unguentum conii, vel cicutæ, to be made as follows: —℞. Foliorum Cicutæ ℔j. Adipis Suillæ ℔iss. Boil the leaves in the melted hog's-lard, until they become crisp. Then strain the ointment.

An hemlock ointment might be more conveniently made, by mixing the extractum conii with any common salve.

**UNGUENTUM DIGITALIS.**—℞. Foliorum Digitalis Purpureæ recentium. Adipis Suillæ præparatæ, sing. ℥iv. This ointment may be made in the same manner as the unguentum cicutæ, and tried in the same cases as the latter.

**UNGUENTUM ELEMI COMPOSITUM.**—℞. Elemi ℔j. Terebinthinæ ℥x. Sevi Ovilli præparati ℔ij. Olei Olivæ ℥ij. Melt the elemi with the suet; remove them from the fire, and mix them immediately with the turpentine and oil. Then strain the mixture.—Sometimes employed for dressing ulcers, which stand in need of stimulating applications.

**UNGUENTUM GALLÆ CAMPHORATUM.**—℞. Gallarum Pulveris Subtilissimi ʒij. Camphoræ ʒss. Adipis Suillæ præparatæ ℥ij. Misce.—This is a very good application to piles, after their inflammatory state has been diminished by the lotio aq. litharg. acet. and leeches.

UNGUENTUM HELLEBORI ALBI.—℞. Hellebori Albi Pulv. ℥j. Adipis Suillæ præparatæ ℥iv. Olei Limonis ℈ss. Misce.—This ointment will cure the itch, and several other cutaneous diseases. Tinea capitis will sometimes yield to it.

UNGUENTUM HYDRARGYRI FORTIUS.—℞. Hydrargyri purificati ℔ij. Adipis Suillæ præparatæ ℥xxiij. Sevi Ovilli præparati ℥j. First rub the quicksilver with the suet, and a little of the hog's-lard, until the globules disappear; then add the remainder of the lard, and make an ointment.—This is the common, strong, mercurial ointment. Of its uses we need say nothing in this place.

UNGUENTUM HYDRARGYRI CAMPHORATUM.—℞. Unguenti Hydrargyri ℥j. Camphoræ ʒss. Misce.—This is often recommended to be rubbed on thickened, indurated parts, with a view of exciting the action of the absorbents. Rubbed along the course of the urethra, it is very serviceable in diminishing and removing chordee.

UNGUENTUM HYDRARGYRI MITIUS.—℞. Unguenti Hydrargyri fort. ℔j. Adipis Suillæ præparatæ ℔ij. Misce.—The weaker mercurial ointment is often rubbed on indurated, thickened parts and tumours, when the object is merely to promote their absorption; and, it is not advisable to employ the unguentum hydrargyri fort. lest a salivation should be induced.

UNGUENTUM HYDRARGYRI NITRATIS.—℞. Hydrarg. Purificati ℥j. Acidi Nitrosi ℥ij. Adipis præparatæ ℥vj. Olei Olivæ ℥iv. Dissolve the quicksilver in the nitrous acid; and whilst the solution is yet hot, mix with it the oil and hog's-lard, previously melted, but beginning to concrete, by being exposed to the air. This ointment is a celebrated application to the inside of the eyelids, in cases of chronic ophthalmy, and also to specks on the cornea. When blended with a little olive oil, it also forms a very eligible stimulating dressing for numerous kinds of sores. It is particularly efficacious in curing tinea capitis, and many other herpetic and cutaneous diseases.

UNGUENTUM HYDRARGYRI NITRICO-OXYDI.—℞. Hydrargyri nitrico-oxydi ℥j. Ceræ Albæ ℥ij. Adipis præpar. ℥vj. Misce.—This is a most common application to indolent ulcers, and sores in general, which require being stimulated.

UNGUENTUM HYDRARGYRI PRÆCIPITATI ALBI.—℞. Hydrarg. Præcip. Albi ʒj. Adipis præparatæ ℥iss. Misce. An useful application in certain cases of porrigo, and some other cutaneous diseases. See *Tinea*.

UNGUENTUM LIQ. PLUMBI ACETATIS.—℞. Liquoris Plumbi Acetatis ℥v. Adipis Suillæ ℔j. Ceræ Albæ ℥iv. Melt the ingredients together, and continue to stir them till cold.—This is an excellent saturnine ointment for ulcers with inflamed edges, and it may be employed with great advantage as a simple dressing in numerous instances.

UNGUENTUM OPHTHALMICUM.—℞. Adipis Suillæ præparatæ ℥ss. Tutiæ præparatæ, Bol. Armen. sing. ʒij. Præcip. Hydrarg. Albi ʒj. Misce.—This is Janin's celebrated ophthalmic ointment, which may be used for the same diseases of the eye and eye-lids, as the unguentum hydrargyri nitrati. It must be at first weakened with about twice its quantity of hog's-lard.

UNGUENTUM PICIS.—℞. Picis, Sevi Ovilli præparati, sing. ℔ss. Melt, and then strain them.

UNGUENTUM PICIS COMPOSITUM.—℞. Unguenti Picis, Unguenti Cerussæ Acetatæ. sing. ℔ss. Misce.

The two preceding ointments are applicable to cases of tinea capitis, and some eruptive complaints. Also to some kinds of irritable ulcers.

UNGUENTUM PICIS CUM SULPHURE.—℞. Unguenti Picis, Unguenti Sulphuris, sing. ℥iv. Misce.—This is one of the most common, and, I believe, the most efficacious, applications for curing tinea capitis, or porrigo.

UNGUENTUM PLUMBI SUPERACETATIS.—℞. Plumbi Superacetatis ʒij. Ceræ Albæ ℥ij. Olei ℔ss. The superacetate of lead, previously powdered, is to be triturated with part of the olive oil. The melted wax and rest of the oil are then to be added. This ointment is a good dressing for cases requiring a mildly astringent, antiphlogistic application.

UNGUENTUM RESINÆ FLAVÆ.—℞. Resinæ Flavæ, Ceræ Flavæ sing. ℔j. Olei Olivæ ℔j. Melt the resin and wax with a slow fire; then add the oil, and strain the mixture while hot.—This is a common application to ulcers, which stand in need of being gently stimulated.

UNGUENTUM SAMBUCI.—℞. Florum Sambuci, Adipis Suillæ, singulorum ℔j. The hogs-lard being melted, boil the elder-flowers in it till they become crisp, then strain the mixture.

UNGUENTUM SULPHURIS.—℞. Adipis Suillæ ℔ss. Florum Sulphuris ℥iv. Misce.

UNGUENTUM TUTIÆ.—℞. Tutiæ præparatæ, Unguenti Spermatis Ceti, q. s. Misce.—Used for smearing the borders and inside of the eyelids, in cases of chronic ophthalmy, &c.

UNGUENTUM TUTIÆ COMPOSITUM.—℞. Tutiæ præparatæ, Lapidis

Calaminaris præparati, sing. ʒvj. Camphoræ ʒij. Unguenti Sambuci ℔j. Misce.

This formula is contained in the Pharmacopœia of St. Bartholomew's Hospital. It may be applied, in some cases, to the inside of the eyelids, also to piles; certain ulcerations, excoriations, &c.

UNGUENTUM ZINCI.—℞.Zinci oxydi ℥j. Adipis præpar. ℥vj. Misce.—Sometimes used in the same affections of the eye and eye-lids, in which the unguentum hydrargyri nitrati, and the unguentum ophthalmicum, are employed.

UNGUIS. (*A Nail.*) Some surgical authors have applied this term to a collection of pus, or matter in the eye, when the abscess has appeared, through the cornea, to be shaped like a finger nail.

UNGULA. (*A Hoof.*) A collection of matter in the eye, shaped like a hoof.

UNION BY THE FIRST INTENTION.—When the opposite surfaces of a wound are brought into contact, and grow together at once, without suppurating, union by the first intention is said to have taken place. When wounds heal by suppurating, granulating, &c. they are sometimes surgically described as getting well by the second intention. See *Wounds.*

URETHRA, STRICTURES OF.—It has been noticed by Mr. John Hunter, that most obstructions to the passage of the urine, if not all, are attended with nearly the same symptoms. Few persons take notice of the first symptoms of a stricture, till they have either become violent, or other inconveniencies have been the consequence. A patient may have a considerable stricture, and yet be unconscious, that his urine does not freely come away; he may often have, in consequence of a stricture, a tendency to inflammation and suppuration in the perinæum, without feeling any obstruction to the passage of his urine, or suspecting that he has any other complaint.

There are three kinds of strictures; viz. the true permanent one, which arises from an alteration in the structure of a part of the urethra; the mixed case, consisting of a permanent stricture and a spasm; and, thirdly, the true spasmodic stricture.

In all these obstructions, Mr. Hunter remarks, that the stream of water becomes small in proportion to the stoppage; but, though this symptom is probably the first, it is not always observed by the patient. In some instances, the water is voided only by drops, and then it cannot escape notice. In other cases, the stream of urine is forked, or scattered. Under such circumstances, Mr. Hunter recommends the passage to be examined with a bougie; and, if one of a common size can be readily introduced, the difficulty of voiding the urine is likely to depend on a diseased enlargement of the prostate gland, which should, therefore, be examined. See *Prostate Gland.*

The spasmodic stricture may be known by its being only of temporary duration. This kind of case, and more particularly the permanent stricture, are generally attended with a gleet. The latter complaint is often for a long while suspected as being the only one, and the surgeon finds all his efforts, to effect a cure, fruitless.

In diseases of the urethra, and also of the prostate gland and bladder, there is commonly an uneasiness about the perinæum, anus, and lower part of the abdomen. (*Hunter.*)

The first progress of the contraction is, in general, very slow; but, when once it has so far increased, that the urethra is not wholly relaxed by the force of the urine, its subsequent advances are more rapid, and new symptoms are perceived. The urine is voided more frequently, does not pass without a considerable effort, attended with pain, and a straining sensation continues, after the bladder is emptied. If the patient accidentally catches cold, drinks a glass of spirituous liquor, acid beverage, or punch, commits an excess in drinking wine, or removes quickly from a warm to a cold temperature, the urine will, perhaps, pass only in drops, or be entirely obstructed. These causes induce, in the contracted part, a spasmodic action, by which it is closed. Cold, externally applied to the body, has so great an effect upon a spasmodic stricture, that a patient, who can make water without the smallest difficulty in a warm room, is often quite unable to void a drop, on making the attempt in the open air. However, on returning to a warm room, and sitting down a little while, he becomes able again to expel his urine. The symptoms of a stricture are more frequent in persons, who lead a sedentary life, than in others whose pursuits are more active. (*Home.*)

Strictures in the urethra, being attended with a discharge and pain in making water, especially after any excess, are frequently regarded and treated as a gonorrhœa. These two symptoms often come on a few hours after connexions with women; the degree of inflammation is very slight; the discharge is the first symptom, and is more violent at the commencement, than at any other period. The inflammation subsides in a few days, leaving only the discharge, which also frequently disappears in five or six days, whether any means are employed or not, for its removal. (*Home.*)

What renders a stricture particularly apt to be mistaken for a gonorrhœa, is the circumstance that, in both diseases, the pain in making water is experienced about an inch and a half from the orifice of the glans penis.

In a more advanced stage, the strictured part of the urethra is always much narrower, than the rest of the canal. However, it retains the power of becoming contracted and relaxed. In the contracted state, the passage is closed up; in the relaxed, the urine can pass through it in a small stream.

The spasmodic contraction must act with considerable force, since the urine cannot even pass in a small stream, and a small bougie, which, in a relaxed state of the urethra, met with no resistance, can now be scarcely introduced at all. Also, if the bougie be allowed to remain for a few minutes in the stricture, it is not unfrequently grasped so tightly by the spasmodic contraction, that, when an attempt is made to withdraw it, some force is requisite to succeed. The bougie, when examined, seems as if it had had an impression made round it by a piece of packthread. (*Home.*)

In old cases of stricture, the muscular coat of the bladder becomes thickened and stronger, than natural, in consequence of more force being necessary to propel the urine through the obstructed part. The bladder, in this thickened state, does not admit of the usual dilation, so that the patient is obliged to make water very frequently, and he is unable to pass the whole night without making this evacuation once or twice. (*Home.*)

A nocturnal emission of the semen is another very common symptom of a stricture; and some patients seem to have no other complaint attendant on the affection of the urethra.

A periodical discharge is sometimes brought on by cold, or other occasional causes. The inflammation extends to the bladder; the frequency of making water is considerably increased, and the urine very turbid. It is voided for twelve, or twenty-four hours, once or even twice every hour; and, when allowed to stand, it deposits a substance in the form of powder, consisting of coagulable lymph. This is the slightest kind of attack.

Sometimes the bladder is inflamed in a greater degree, and secretes pus, which is discharged with the urine. In a still more violent attack, the discharge is similar to the white of an egg, and particularly adhesive. Sir Everard Home states, that it has been discovered by examinations after death, to be the vitiated secretion of the prostate gland. When the inflammation of the bladder becomes still worse, the affection sometimes extends to the peritoneum, and the patient dies.

Since strictures of long standing always impede the passage of the urine, the bladder acts with augmented force to overcome the resistance. In this manner, the stricture is kept in a continual state of irritation, and made to contract in a greater degree.

In a few cases, indeed, the diseased part of the urethra is rendered quite impervious; and the patient's life is preserved by the urethra ulcerating, at some point within the obstruction, and fistulous openings taking place in the perinæum. See *Fistulæ in Perinæo.*

Strictures are frequently attended with constitutional symptoms, one of the most common of which, in warm climates, is a complete paroxysm of fever. The cold fit is very severe; this is followed by a hot fit, and then a very profuse perspiration. During the rigor, nausea and vomiting generally occur, and at this period the patient has occasion to make water frequently, seldom experiencing at the same time any strangury. When the fit is tolerably complete, the patient suffers, in general, only one; in the opposite circumstance, two; but, a greater number rarely happen. Such febrile paroxysms are not frequent in cold countries; but do every now and then take place, particularly in consequence of exposure to cold, excesses, and the introduction both of common and armed bougies.

With regard to the formation of strictures, Sir Everard Home has noticed, that the membrane of the urethra, like every other muscular structure, is liable to a spasmodic contraction, in which state the canal loses the power of relaxing itself again, till the spasm is removed. This spasmodic stricture is only a wrong action of the urethra; and, if the parts could be examined in their relaxed state, there would be no appearance of disease.

A part of the urethra, once disposed to become preternaturally contracted, generally becomes more and more affected in this manner, and, at last, becomes permanently narrower. The case now becomes both a permanent stricture and a spasmodic one; being so far permanent, that it is always narrower, than the rest of the canal, and so far spasmodic, that it may become contracted in a still greater degree.

When the contraction is not considerable, it appears, on examination after death, to be merely a narrowing of the urethra; but a permanent stricture, in a more advanced state, usually consists of a ridge, which forms a projection in the passage. (*Home.*)

Mr. Hunter informs us, that the disease generally occupies no great length of the passage; at least, that this was the case in most of the instances, which he had examined. In these the contraction was not broader, than if it had been produced by surrounding the urethra with a piece of packthread; and in many it had a good deal of the appearance, which one may fancy such a cause would produce. Mr. Hunter states, however, that he had seen the urethra contracted for above an inch in length, owing to its coats, or internal membrane, being irregularly thickened, and forming a winding canal.

A stricture does not always arise from an equal contraction of the urethra all round; for, in some instances, the contraction is only on one side. This contraction of one side of the canal only throws the passage to the opposite side, which often renders the introduction of a bougie difficult. The contracted part is whiter, than the rest of the urethra, and is harder in its consistence. In some few cases, there are more strictures than one. Mr. Hunter mentions his having seen half a dozen in one urethra, and he observes, that a stricture is frequently attended with small tightnesses in other parts of the urethra.

Mr. Hunter remarks, that every part of the urethra is not equally subject to strictures, the bulbous portion being much the most subject to the disease. A stricture is sometimes situated on this side of the bulb, but very seldom beyond it, that is, nearer the bladder. Mr. Hunter never saw a stricture in that part of the urethra, which passes through the prostate gland; and the bulb, besides being the most frequent seat of this disease, is also subject to it in its worst forms. (*Hunter.*)

Sir E. Home has measured the length of the urethra in different subjects, and examined the diameters of the several parts of the passage. Strictures, according to this gentleman, occur most commonly just behind the bulb of the urethra, the distance from the external orifice being 6½, or 7 inches. The situation, next in the order of frequency, is about 4½ inches from the orifice of the glans. The disease does also occur at 3½ inches, and, sometimes, almost close to the external orifice. The two parts of the urethra, most frequently affected with strictures, are naturally the narrowest. Sometimes the very orifice of the urethra is contracted, and the circumstance often leads to an erroneous supposition, that the whole canal is naturally formed of the same size. The prepuce also is observed to be particularly often affected with a natural phymosis, in persons, who have strictures in the urethra.

In almost all the cases, which Sir E. Home has met with, there has been one stricture, about seven inches from the external orifice, whether there were any others, or not.

With respect to the causes of strictures, some writers have imputed the disorder to the effects of the venereal disease, and often to the method of cure. Mr. Hunter, however, entertained very strong doubts, whether strictures commonly, or even ever, proceeded from these causes; though he acknowledges, that since most men have had venereal complaints, a refutation of the above opinion is very difficult. Mr. Hunter was led to think, that strictures did not commonly arise from venereal causes, from reflecting that strictures are common to most passages in the human body. They often take place in the œsophagus; the intestines, particularly, the rectum; the anus; the prepuce, so as to produce phymosis; and in the lachrymal duct, so as to occasion a fistula lachrymalis. Strictures sometimes take place, when there have been no previous venereal complaints. Mr. Hunter mentions his having seen an instance of this kind in a young man, nineteen years of age, who had had the complaint for eight years, and which therefore began, when he was only eleven years old. He was of a weak, scrophulous habit. Mr. Hunter had also seen a stricture in a boy only four years old, and a fistula in perinæo in consequence of it. Strictures happen as frequently in persons, who have had the gonorrhœa in a slight degree, as in others, who have had it in a severe form.

Many believe, that strictures arise from the use of injections in the treatment of the gonorrhœa; but, Mr. Hunter thought, that this opinion was founded on prejudice, and he states, that he had seen as many strictures after gonorrhœas, which had been cured without injections, as after those, which had been treated with these latter applications.

Mr. Hunter also disbelieved the idea, that strictures are a consequence of ulcers in the urethra; for, ulcers hardly ever occur in this passage, except when there are strictures. It is now generally admitted, that, in gonorrhœa, no sores exist in the urethra.

### TREATMENT OF STRICTURES, WITH COMMON BOUGIES, ON THE PRINCIPLE OF DILATATION.

Mr. Hunter remarks, that the cure of strictures may be accomplished, either by a dilatation of the contracted part, or a destruction of it by ulceration, or escharotics. The dilatation is accomplished by means of bougies; but, Mr. Hunter considered, that a cure, thus effected, was seldom or never more, than temporary. The removal of the stricture by ulceration, may also be effected with bougies. Its destruction with caustic used formerly to be executed through a cannula, contrived for the purpose; but, is now performed by means of *caustic*, or *armed bougies*.

The cure by dilatation is principally mechanical, when effected by bougies, the powers of which are generally those of a wedge. However, Mr. Hunter remarks, that their ultimate effect is not always so simple as that of a wedge upon inanimate matter; for, pressure makes living parts either adapt themselves to their new position, or else recede by ulceration. Bougies, of course, either dilate strictures, or make them ulcerate.

The disease has generally made considerable progress, before the patient seeks surgical assistance, and the stricture may be so advanced, that a small bougie cannot be made to pass, without a great deal of trouble. If the end of a small bougie, let it be ever so small, can be introduced through the stricture, the cure is then in our power. However, a small bougie frequently cannot be passed in the first instance, and even not after repeated trials.

Often, when the stricture is very considerable, a great deal of trouble is given by occasional spasms, which either resist the introduction of a bougie altogether, or only allow a very small one to pass. At other periods, however, a larger one may be introduced. In these circumstances, Mr. Hunter mentions, that he was sometimes able to get the point of a bougie to enter, by rubbing the outside of the perinæum with the finger of one hand, while he pushed the bougie on with the other. The same eminent practitioner often succeeded by letting the bougie remain a little while close to the stricture, and then pushing it on. Sometimes, the spasm may also be taken off by dipping the glans penis in cold water.

Although, in cases of permanent strictures, the bougie may not pass at first, yet, after repeated trials, it will every now and then find its way. In this manner, future attempts become more certain and easy.

However, the success of the subsequent trials to introduce a bougie does not always depend on the instrument having been once, or twice passed. Sometimes, it can be introduced to-day; but, not tomorrow; and, in this state, the case may continue for weeks, notwithstanding every trial we can make. Mr. Hunter observes, however, that, in general, the introduction of the bougie becomes gradually less difficult, and, therefore, that we ought not to despair of success in any case.

When the passage is very small, it is not easy to know, whether the bougie has entered the stricture, or not: for bougies, as slender as those, which must be at first employed, bend so very easily, that the surgeon is apt to fancy, that they are passing along the urethra, while they are only bending. Mr. Hunter advises the surgeon to make himself, at first, acquainted with the situation of the stricture, by means of a common-sized bougie. Then he is to take a smaller one, and when its point arrives at the stricture, the instrument is to be gently pushed forward; but, only for a short time. If the bougie has passed further into the penis, the surgeon may know how far it has entered the stricture by taking the pressure off the bougie. For, *if it recoil*, he may be sure, that *it has not passed*; at least, has not passed far; but, only bent. On the contrary, *if it remain fixed, and do not recoil, it has certainly entered the stricture.*

Mr. Hunter informs us, however, that the preceding remarks are not so applicable, when a very small bougie is employed, which may become bent, without our being aware of the circumstance.

A bougie may frequently be introduced a very little way, for instance, only one-tenth of an inch, and then it bends, and cannot be pushed further. To determine whether this is the case, Mr. Hunter says, it is necessary to withdraw the bougie and examine its end. If the end be blunted, we may be sure that the bougie has not entered at all; but, if it be flattened, for an eighth, or tenth, of an inch, be grooved, or have its outer waxen coat pushed up to that extent; or, if there be a circular impression made upon the bougie, or only a dent on one side, made by the stricture; we may be sure, that the instrument has passed as far as these appearances extend. It then becomes necessary to introduce another of exactly the same size, and in the same manner, and to let it remain as long as the patient can bear it, or convenience will allow. By repetitions of this plan, the stricture will be overcome.

Mr. Hunter remarks, that the time, which each bougie ought to remain in the passage, must be determined by the feelings of the patient; for, if possible, no pain should ever be given. If the patient should experience very acute pain when the bougie is passing, it ought not to be left in the urethra above five, or, at most, ten minutes; or, not so long, if the pain be exceedingly severe. Each time of application should afterwards be lengthened so gradually as to be imperceptible to the feelings of the patient, and the irritability of the parts. Mr. Hunter affirms, that, he has known many patients, who could not bear a bougie to remain in the passage ten, or even five minutes, till after several days, and even weeks, but, who in time were able to wear the instrument for hours, and this, at last, without any difficulty. The best time for keeping a bougie in the urethra, is when the patient has least to do; or, in the morning, while he is in bed, if he can introduce the instrument himself.

Mr. Hunter next observes, that the bougie should be increased in size, according to the facility, with which the stricture becomes dilated, and the ease, with which the patient bears the dilatation. If the parts are very firm, or very irritable, the increase of the size of the bougie should be very slow, so as to allow them to become gradually adapted to the augmented size of the instrument. But, if the sensibility of the parts will allow, the increase of the size of the bougie may be somewhat quicker, but, never more sudden, than the patient can easily bear. The surgeon must continue to increase the size of the bougie, till one of the largest size can freely pass; nor should the use of this be discontinued till after three weeks, or a month, in order that the dilated part may have time to become habituated to its new position, and lose its disposition to contract again. However, Mr. Hunter believed, that the permanency of a cure, effected on the principle of dilatation, could seldom be depended upon.

### CURE OF STRICTURES BY ULCERATION.

This is also accomplished by means of a bougie, and the plan may be tried both when the instrument can, or cannot, be introduced through the stricture. In the first instance the method is less proper; because the stricture admits of being dilated.

In order to cure a stricture by making it ulcerate, the bougie is to be introduced as far through the contracted part as possible, and the size of the instrument is to be augmented, as fast as the sensations of the patient can well bear. In this manner, ulceration will be produced in the part, which is pressed, and, Mr. Hunter remarks, that the cure will be more lasting, because more of the stricture is destroyed, than when the parts are simply dilated. This eminent surgeon notices, however, that few patients will submit to this practice, and that few, indeed, would be able to bear it, since it is apt to bring on violent spasms in the part, attended with a very troublesome retention of urine.

If the smallest bougie cannot be made to pass a stricture, by using some degree of force, dilatation becomes impracticable; and, as the stricture must be destroyed, something else must be tried. In many cases, says Mr. Hunter, it may be proper to get rid of the stricture by making it ulcerate, or, in other words, be absorbed. Bougies, intended to excite ulceration, need not be so small, as in the foregoing cases, as they are not designed to be passed through the stricture; and, in consequence of being of the common size, they may be more surely applied to the parts, causing the obstruction. The force, applied to a bougie, in this case, should not be great; for, a stricture is the hardest part of the urethra; and if a bougie is forcibly pushed on, its end may slip off the stricture, before ulceration has commenced, and make a false passage for itself in the corpus spongiosum urethræ.

In trying to cure strictures by ulceration, the utmost attention must be paid; and, if the patient does not make water better, notwithstanding the bougie passes further, the surgeon may be sure, that he is forcing a false passage.

When the stricture has so far yielded, as to allow a small bougie to be introduced, the treatment is then to be conducted on the principle of dilatation.

Mr. Hunter observes, that whenever a bougie of a tolerable size passes with ease, and the parts and the patient have become accustomed to it, the surgeon need no longer attend for the purpose of introducing it. The patient may now be allowed to introduce bougies himself; and when he can do this with ease, the business may be trusted to him, as he can make use of the instruments at the most convenient times, so that they may be more frequently, and longer, applied. In the mean while, the surgeon should only pay occasional visits. Mr. Hunter adds, that, this practice of the patient, under the surgeon's eye, by which means, the former learns the art of introducing bougies, is the more necessary, since strictures are diseases, which commonly recur; and, therefore, no man, who has ever had a stricture, and is cured of it, should rely on the cure as lasting; but, should always be prepared for a return, and always have some bougies by him. He should not go a journey, even of a week, without them; and the number should be according to the time, which he is absent, and the place, to which he is going; for in many parts of the world, he cannot be supplied with them.

To prevent the inconvenience of a bougie slipping out, or the mischief of its gliding into the urethra, a soft cotton thread must be tied round that end of the bougie, which is out of the urethra, and then round the root of the glans. This last part of the thread should be very loose. The projecting portion of the bougie should also be bent down upon the penis, by which means, it is rendered less troublesome, and more secure. (See *Hunter on the Venereal Disease.*) When a considerable part of the bougie remains out of the urethra, surgeons usually clip a piece of it off.

In many examples, in which a stricture is accompanied with excessive irritability in the urethra, much pain, and a tendency to frequent retentions of urine, whenever a common bougie is employed, it becomes advisable to alter the plan of treatment, and use either flexible metallic, or elastic gum bougies. (See *Bougie.*) Desault commonly cured all strictures by the skilful employment of flexible gum catheters, which his patients were directed to wear a certain length of time every day. These last instruments produce less pain and irritation, than any kind of bougie, more especially when the wires are withdrawn; and were I to be myself afflicted with strictures, I should feel strongly disposed to attempt their removal by the use of elastic gum catheters, which are unquestionably the mildest and least painful means of cure. I lately saw a case, in which the flexible metallic bougie seemed to cause much less irritation, than any other kind of bougie, but, in general, those made of elastic gum give the least pain. Metallic bougies possess the advantage of retaining the exact curvature of the passage, better than others. Small catgut bougies are chiefly eligible, when the cure by dilatation is preferred, and the smallest bougies of other descriptions cannot be introduced through the stricture.

## CURE OF STRICTURES BY THE ARGENTUM NITRATUM.

Wiseman makes mention of the plan of curing strictures in the urethra by means of caustic. He observes, that, when the obstruction is a caruncle, and you cannot pass it, you may well conclude it is callous: "in which case, you may pass a cannula into the urethra to that caruncle, and, whilst you hold it there steady, you may convey a grain of caustic into the cannula, and press the caustic to it; and, whilst you hold it there, you will perceive its operation, by the pressing forward of the cannula."

About the year 1752, Mr. Hunter attended a chimney-sweeper, who had a stricture. Not finding, that any benefit was derived from the use of common bougies, for a space of six months, Mr. Hunter, unaware of the above passage in Wiseman, conceived, that the stricture might be destroyed by escharotics, and the first attempt, which he made, was with red precipitate. He put some salve on the end of a bougie, and then dipped it in red precipitate. The bougie, in this state, was passed down to the stricture; but, Mr. Hunter found, that it brought on considerable inflammation all along the inside of the passage, as he thought, in consequence of the precipitate being rubbed off, while the bougie was passing to the stricture. Mr. Hunter then introduced a silver cannula down to the stricture, and again passed the bougie with precipitate through the tube. As the patient, however, did not make water any better, and the smallest bougie could not be introduced through the stricture, he suspected, that the precipitate had not sufficient power to destroy the obstruction. Mr. Hunter was, therefore, induced to fasten a small piece of the argentum nitratum on the end of a piece of wire with sealing-wax, and introduce the caustic through the cannula to the stricture. After having made the application three times, at intervals of two days, he found, that the man voided his urine much more freely, and, on applying the caustic a fourth time, the cannula went through the stricture. A bougie was introduced for a little while afterwards, till the man had completely recovered.

Having experienced such success in the foregoing example, Mr. Hunter was encouraged to apply his mind to the invention of some instrument, better suited to the purpose, than the above contrivance. He succeeded in devising an improved instrument, although he acknowledges, that it was not perfectly adapted to strictures in every situation in the urethra. He remarks, that the caustic should be prevented from hurting the unaffected part of the urethra by introducing the active substance, through a cannula, down to the stricture; and it should be capable of protruding a little beyond the end of the cannula, by which means it will only act upon the stricture. The caustic should be fixed in a small portcrayon, and it is necessary to have a piece of silver of the length of the cannula, with a ring at one end, and a button at the other, of the same diameter as the cannula. The button forms a kind of plug, which should project beyond the end of the cannula in the urethra, so as to make a rounded end; or, Mr. Hunter says, the portcrayon may be formed with this button at its other end. The cannula, with the button, is to be passed into the urethra, and when it reaches the stricture, the silver plug should be withdrawn, and the portcrayon with the caustic introduced in its place; or, if the plug and portcrayon are on the same instrument, then it is only necessary to withdraw the plug, and introduce the portcrayon with the caustic. The plug, besides giving a smooth rounded end to the cannula, answers another good purpose, by preventing the tube from being filled with the mucus of the urethra, when the instrument is passing inward, which mucus would be collected in the end of the cannula, dissolve the caustic too soon, and hinder its application to the stricture.

When the stricture was beyond the straight part of the urethra, Mr. Hunter owned, that it was difficult to apply caustic to the disease through a cannula.

A better mode of applying lunar caustic to strictures was afterwards devised by Hunter, and has since been extensively introduced into practice by Sir E. Home. This gentleman directs us to take a bougie of a size, that can be readily passed down to the stricture, and to insert a small piece of lunar caustic into the end of it, letting the caustic be even with the surface, but surrounded every where laterally by the substance of the bougie. This should be done some little time before it is required to be used; for, the materials, of which the bougie is composed, become warm and soft by being handled in inserting the caustic; and, therefore, the hold, which the bougie has of the caustic, is rendered more secure after the wax has been allowed to cool and harden. The bougie thus prepared, is to be oiled and made ready for use; but, before passing it, a common bougie of the same size is to be introduced down to the stricture, in order to clear the canal, and to measure the exact distance of the stricture from the orifice of the urethra. This distance being marked upon the armed bougie, it is to be passed down to the stricture, as soon as the other is withdrawn. The caustic, in its passage, is scarcely allowed to come into contact with any part of the membrane, because the point of the bougie, of which the argentum nitratum forms the central part, always moves in the middle line of the canal; and, indeed, the quickness with which it is conveyed to the stricture, prevents any injury of the membrane lining the passage when the caustic accidentally touches it.

In this mode the caustic is passed down with little or no irritation to the lining of the urethra, it is applied in the most advantageous manner to the stricture, and can be retained in that situation sufficiently long to produce the desired effect.

The reasons urged in favour of the employment of bougies armed with the lunar caustic, are: that a permanent cure is effected, which common bougies cannot accomplish; that the pain, arising from the application of the argentum nitratum to the stricture, is very inconsiderable; and that neither pain nor inflammation are found to ensue. The meaning of these remarks, however, is to be received as a general one, liable to exceptions. Indeed, Sir E. Home himself has candidly acknowledged, that some inconveniences occasionally follow the use of armed bougies. But, what practice, however judicious and eligible, is altogether free from occasional ill-consequences? Sir E. Home remarks, that against treating strictures of the urethra, with caustic bougies, numerous objections have been adduced, and many bad consequences have been attributed to the practice without any real foundation; "for, whatever, *à priori*, might be supposed the effects of so violent an application, to a membrane so sensible and irritable, as the urethra, and I will admit, that it is very natural to conceive they would be very severe, the result of experience, the only thing to be relied on, evinces the contrary. The pain, that is brought on, is by no means violent; and neither irritation, nor inflammation, is found to take place.

"That cases do occur, in which strictures have produced so much mischief, and rendered so great an extent of the canal diseased, that the use of the caustic has proved unsuccessful, is certainly true; and several of these cases have fallen within my own knowledge. But, when it is stated that none, even of these, were made worse by its use; that no bad consequences attend it; and that no other mode, at present known, is equally efficacious; any occasional want of success cannot be considered as an objection to this mode of practice.

"But if the apprehension of violent effects from the caustic, however ill-founded, cannot be removed, let the alternative be considered; namely, the only operation previously in use, where a stricture cannot be dilated by the bougie.

"In those cases we are obliged to have recourse to means certainly more severe and violent, laying open with a knife the diseased urethra, and passing through the divided parts a flexible gum catheter into the bladder. This I have done myself, and have frequently seen it performed by Mr. Hunter, and it always succeeded; neither bringing on so much inflammation as was expected, nor being attended with any symptoms of irritation.

"This practice has by other surgeons been carried still further; the portion of diseased urethra has been dissected out, and entirely removed; nor has so severe an operation always brought on untoward symptoms; and patients have recovered.

"If the membrane of the urethra, when diseased, is capable of suffering so much injury, without any consequent symptoms of irritation, it cannot be doubted that it will bear with impunity to be touched, in a very partial manner, several different times with lunar caustic."

Sir Everard afterwards proceeds: "having met with a number of facts, from which a general principle appears to be established, that the irritable state of a stricture is kept up, and even increased, by the use of the bougie, but lessened and entirely destroyed by the application of lunar caustic; I am desirous to communicate my observations upon these facts, and to recommend the use of the caustic, in many cases of irritable stricture, *in preference to the bougie.*

"As the use of the caustic, upon this principle, is, I believe, entirely new, and is contrary to every notion, that has been formed upon the subject, it will require something more, than general assertion, to gain even the attention of many of my readers, still more their belief; I shall therefore detail the circumstances, as they occurred, by which I conceive the propriety of this practice to be established; and afterwards make some observations upon the principle on which it depends.

"My connection in practice with Mr. Hunter afforded me opportunities of attending to cases of stricture, in all their different stages; many of them brought on during a long residence in India, attended with great irritability, and exceedingly difficult of cure.

"One case of this kind admitted the passing of a small bougie; but, in the course of three years, very little was gained by a steady perseverance in the use of that instrument, either in dilating the canal, or palliating the symptoms of stricture; this made me look upon the bougie as less efficacious, than I had always been taught to believe it. I was willing, however, to consider this as an uncommon case, depending more on the peculiarities of the patient's constitution, than on the nature of the disease: but, I found, on a particular enquiry, that several other gentlemen, from India, were under circumstances nearly similar; the bougie only preventing the increase of the stricture, but being unable to dilate it beyond a certain size; and when it was left off, the stricture in less than two months returned to its former state of contraction.

"What plan ought to be followed in such cases, I was then unable to determine; but, that the bougie could not be depended on was evident. During this suspense, the following case came under my care.

"In August, 1794, a gentleman consulted me for some symptoms, which had been considered as indicating the presence of gonorrhœa; but, as they did not yield to the common treatment in the usual time, he was induced to take my advice respecting the nature of his complaint. In the necessary enquiry, to obtain a perfect history of the case, among other things it was stated, that, nineteen years before, there was a stricture, which became very troublesome, and that Mr. Hunter, by the desire of the patient, had applied the caustic, by which the stricture was removed, and never afterwards returned. He said that he was one of the first persons on whom the caustic had been used. From this account, I was naturally led to believe that the stricture had gradually returned, and was now increased, so much as to produce the present symptoms; a discharge being almost always a symptom of stricture, when it is much contracted; but, upon examining the canal, a bougie of full size passed on to the bladder without the smallest impediment. I therefore took up the case as an inflammation in the urethra; and large doses of the balsam copaiva, given internally, effected a cure.

"The circumstance of a stricture having been removed nineteen years before, and not returning, made a strong impression on my mind; and made me desirous to ascertain, whether this practice could be employed in cases of stricture in general, and the cure produced by it, equally permanent. A short time afterwards, I had an opportunity of trying it in the following case.

"A captain, in the East India Company's service, in September, 1794, applied to me for assistance. His complaints were, great irritation in the urethra and bladder, constant desire to make water, and an inability to void it, except in very small quantities. These symptoms had been at first supposed to arise from gonorrhœa, afterwards rendered more severe by catching cold: but, not yielding to the usual remedies for gonorrhœa, they were investigated more minutely, and a stricture was discovered in the urethra. The mode of treatment was now changed, and the bougie employed; but its use aggravated all the symptoms, and brought on so great a degree of irritability in the bladder and urethra, that there was an alarm for the patient's life, which was the reason for applying for my assistance.

"Besides the local symptoms, this patient had those of quick pulse, white tongue, hot and dry skin, loss of appetite, and total want of sleep, with frequent attacks of spasm on the bladder and urethra. A very small flexible gum catheter was passed, and the water drawn off, in quantity about a pint, which gave him great relief; this was repeated morning and evening, to keep the bladder in as easy a state as possible; but, in other respects, he continued much the same.

"As the present symptoms were brought on by the use of the bougie, little good was to be expected from that instrument; and where the urethra had been so easily irritated, and was disposed to continue in that state, there was no prospect of the use of the bougie afterwards effecting a cure. These circumstances I explained to the patient; and mentioned in proof of my opinion, the case, in which so little had been effected in three years.

"I then proposed to him a trial of the caustic, with a view to deaden the edge of the stricture, as the only probable means of effecting a cure. The degree of irritation was already great; I was, however, led to believe, that the application of the caustic was not likely to increase it; since, by destroying the irritable part, it might lessen, and even remove, the spasmodic affection; but if, contrary to my expectation, the irritation continued, we still should be able to draw off the water, as the slough formed by the caustic would prevent the edge of the stricture from acting and obstructing the instrument.

"The application of the caustic was, upon these grounds, determined on; and it was applied in the following manner.

"I passed a common bougie, nearly the size of the canal, down to the stricture, to ascertain its exact situation, and to make the canal of the urethra as open as possible. The distance was then marked, upon a bougie armed with caustic, of the same size, which was conveyed down as quickly as the nature of the operation would admit. It was retained upon the stricture, with a slight degree of pressure; at first there was no pain from the caustic, but a soreness from pressure; in less than a minute, a change was felt in the sensation of the part, it was at first a heat, succeeded by the burning pain peculiar to caustic; as soon as this was distinctly felt, the bougie and caustic were withdrawn, having remained in the urethra about a minute altogether. The soreness, he said, was entirely local, by no means severe, was unaccompanied by irritation along the canal, and he thought the uneasiness in the bladder diminished by it. He described the pain as resembling very exactly the first symptoms of gonorrhœa. This sensation lasted half an hour after withdrawing the bougie.

"The caustic was applied about one o'clock in the forenoon, and he passed the day more free from irritation than he had been since the beginning of the attack, which had lasted six days. In the evening, the water was drawn off, with more ease than the night before. He passed a tolerable night, and, the next day, continued free from irritation. On the third day, the caustic was again applied in the forenoon; the painful sensation was less than on the former application, lasted a shorter time, and in an hour after the armed bougie was withdrawn, he made water freely for the first time since the commencement of his indisposition. He said the irritation in the bladder was removed, and he felt very well, his appetite returned, he slept very well, and continued to void his urine with ease.

"In this state, nothing was done till the fifth day, leaving always a day between the applications of the caustic.

"On this day a common-sized bougie went readily into the bladder; it was immediately withdrawn, and the cure was considered as complete; no bougie was afterwards passed, lest it might bring back an irritation upon the passage. I met this gentleman twelve months afterwards, and he assured me, he had continued perfectly well, and I have since learned, that, in three years, there has been no return.

"From the result of this case, I was encouraged to hope that the caustic might be applied to strictures in the urethra with more confidence than I had hitherto believed, since it evidently did not bring on, or increase the general irritation, but, on the contrary, seemed to allay it."

The foregoing case, together with another one, which Sir E. Home has related, convinced this gentleman, that he had discovered an effectual mode of treating such strictures, as do not admit of being relieved by the common bougie. Hence, he adopted the use of armed bougies, as a general practice; but, he has not concealed the circumstances, under which the method has not proved successful. Sir Everard informs us that "In some constitutions, where the patients have resided long in warm climates, every time the caustic is applied to a stricture, a regular paroxysm of fever called by the patient an ague, takes place; and this has been so violent as to render it impossible to pursue this mode of practice. Of this I have met with two instances. I consider this disposition to fever as the effect of climate, and not of any natural peculiarity of constitution; for the brother of one of these patients laboured under the same disease, but as he had not been in warm climates, it was removed by the caustic without his experiencing such attacks."

In *gouty* constitutions, attacks of the gout have in two instances brought on spasmodic constrictions, after the stricture had been removed by caustic. This, however, cannot be called a failure of the caustic. It only shews, that gout can affect strictures, and re-produce them.

"In some patients, the strictures are so obdurate, that the use of the caustic is necessary to be continued for a longer time than the parts can bear its application, or even that of the bougie passing along the urethra; irritation therefore comes on and stops the progress of the cure, and when the same means are resorted to again, the same thing takes place. The cases of failure of this kind that I have met with, some of which may yet ultimately be cured, if the patients will take the necessary steps for that purpose, amount in all to six.

"In some patients, the stricture is readily removed by the caustic, but, in a few weeks, contracts again. The stricture being wholly spasmodic, the caustic, by taking off the spasm, is allowed to pass through, and cannot completely destroy the stricture. Of this kind, I have met with one instance, which I must consider as a failure, as I have hitherto been unable to get the better of it.

"In those cases, where the caustic gradually removes the stricture, and brings the urethra to a size, that allows the patient to make water perfectly well, if there is any return, it is not to be attributed to the failure of the caustic, but to the want of proper management, either from the caustic being too small, or its use left off too soon; but, all such cases are, I believe, within the power of being cured by the caustic, if its use is recurred to when that is found necessary."

For the generality of strictures in the urethra, which certainly do not occupy more extent of the canal, than if caused by a piece of packthread being tied round it, the bougies, armed with the lunar caustic, should be preferred. But, there are instances, in which the urethra is diminished in diameter, for an inch or more: in these cases, I cannot help considering the employment of common bougies most advantageous, that is to say, when they can be introduced through the stricture, so as to cure it on the principle of dilatation.

We shall conclude this part of the subject of strictures, with inserting some of the general directions given by Sir E. Home how to arm the bougie, and apply the lunar caustic to strictures.

In arming a bougie, it will be difficult to get a piece of caustic of a proper shape and size for the purpose, unless it be cast in a small cylindrical mould. "In this state (says Sir Everard) it is to be procured from Mr. Savigny, and, if these pieces are thicker than the bougie can readily enclose, by putting them in water, the outside quickly dissolves, so as to diminish their size, as much as is required. The piece of caustic, so prepared, is to be cut into small portions, about a quarter of an inch in length, and an orifice being made in the end of a bougie, the caustic is to be inserted into it, and the bougie rolled, so as to be made perfectly smooth, taking care, that the sides of the caustic are every where covered, and only the end exposed.

"This (continues Sir Everard Home) was the mode, in which I armed bougies, when I first took up this practice; but, it happened, that, in two or three instances, the caustic was left in the urethra; that canal, when in a very irritable state, grasped the bougie, and pulled the caustic out; I was therefore led to consider how such an accident might be prevented, and applied to the makers of bougies for that purpose. Mr. Pass, the late beadle of the Surgeons' Company, who dealt in bougies, discovered a very ingenious and effectual mode of securing the caustic. In forming the bougie, a piece of wire, the size of the caustic, is rolled up along with it, passing into the substance for half an inch; when the bougie is nearly finished, the wire is withdrawn, and the caustic inserted in its place; after this, the bougie is rolled again, so that the sides of the caustic become firmly cemented to the linen, by means of the composition of the bougie, and when cold, cannot be separated by any force. In this way bougies are now generally armed.

"After the bougie has been thus prepared, the distance of the stricture from the external orifice is to be measured, and the canal cleared by passing a common bougie, fully as large as that which is armed. The armed bougie, with the distance marked upon it, is then to be introduced, and applied to the stricture; when it is brought in contact with the obstruction, it is to be steadily retained there, with a moderate degree of pressure at first, and less as it is longer continued, since the bougie becomes soft by remaining in the urethra, and readily bends, if the pressure is too great. The time it is to remain depends a good deal upon the sensations of the patient, and the length of time the parts have been diseased; but on the first trial, it should be less than a minute, as it then commonly gives greater pain than on any subsequent application. The pain produced by the caustic is not felt so immediately as it would be natural to expect; the first sensation arises from the pressure of the bougie on the stricture; a little after, there is the feeling of heat in the parts; and lastly, that of pain.

"As soon as the caustic begins to act, the surgeon, who makes the application, is made sensible of it by the smaller arteries of the parts beating with unusual violence, which is very distinctly felt by the finger and thumb, that grasp the penis.

"The pain that is brought on by the caustic lasts for some time after it is withdrawn; but this period differs in almost every patient, being sometimes extended to half an hour, and sometimes only a few minutes.

"The kind of pain is heat and soreness, which is not severe, not being accompanied by the peculiar irritation, upon so many occasions experienced by patients who have strictures; an irritation that cannot be described, which is most insupportable, and is too often brought on by dilating strictures with the bougie. After the caustic has been withdrawn, it is desirable, that the patient should make water before he uses exercise, as the parts are commonly more tranquil after having done so; but sometimes no water will flow at the first effort. When that is the case, it should not be urged, as it is not of any material consequence. It happens not unfrequently, that at the first time of making water, some blood passes along with it. This is rather favourable; as, when the parts bleed, the stricture usually proves to be so far destroyed, that at the next trial the bougie passes through it. Every other day appears in general to be as often as it is prudent to apply the caustic. I have, however, done it every day, in very obstinate cases, where the parts are less sensible, without any detriment.

"The bougie, which is passed down to prepare the way for the caustic, and measure the distance for the armed bougie, must be made of soft materials, that it may readily receive an impression from the part against which it is pressed, and its colour should be light, so as to admit of those impressions being more distinctly seen. With the assistance of such bougies, I am able to discover the size and shape of the orifice of the stricture; to ascertain with accuracy the progress of the caustic upon it; to see whether it is on one side of the canal, or equally all round; and to apply the caustic accordingly.

"When the soft bougie passes through the stricture, by leaving it in the canal a few minutes, it can be known whether the stricture is completely destroyed or only relaxed; in the last case, there is an impression on the side of the bougie.

"So necessary is the information, which is acquired in this way, to enable the surgeon to prosecute the cure of stricture by means of the caustic, that without it I should have been unable to pursue this mode of practice. I should have wanted a sufficient degree of confidence to carry me on, which nothing but an accurate knowledge of what had been already done could have given, and, in no other way, is that to be acquired." (*Home on Strictures.*)

### CURE OF STRICTURES BY THE POTASSA FUSA.

Mr. Whately, in his publication on strictures, has endeavoured to shew, that they are not merely contracted fibres of the urethra, but really diseased portions of the membrane lining that canal, with a continued disposition to increased contraction. Hence, this gentleman seems to conceive, that the application of a remedy, calculated both to remove the diseased affection, and to dilate the contracted part, might perfectly cure the complaint, without putting the patient to the inconvenience of wearing a bougie. Mr. Whately affirms, that such a remedy is caustic, when judiciously used. Hitherto the lunar caustic has been chiefly employed; but, this gentleman states, that it has been his good fortune to discover a more efficacious, and, at the same time, a less painful and hazardous remedy for the disease in question. The potassa fusa is the application alluded to, which Mr. Whately says, if used in the manner, and with the precautions about to be described, will be found to possess singular efficacy in curing the complaint. He avows, that he has already had so much experience of it, and that he is so perfectly convinced of its superiority over the lunar caustic, as well as over the common bougie, that he now uses it in a considerable number of the cases, which come under his care. Of its safety he is also as well convinced, as of its efficacy; for, if used with circumspection, experience shews, that there is little danger of its producing any disagreeable effect.

However, if the potassa fusa be applied while the parts are in a highly inflamed, or irritable state, or (as Mr. Whately adds) tending to gangrene; if the habit be bad, and the patient very far advanced in years; we may expect the most mischievous effects from the application; and this practitioner censures the use of any kind of caustic under such circumstances, for strictures in the urethra, as dangerous in the extreme.

Mr. Whately represents, that if the patient be affected with fever, or any other acute disease; if he be much indisposed from any cause; if, in particular, he have a gonorrhœa, attended with much inflammation and irritation in the urethra; if the prepuce, glans, or any other part of the penis, or the parts adjoining to it, be swelled and inflamed; if the urethra, and especially the strictured part of it, be so irritable, as not to bear the touch of a bougie; the use of the caustic is for the present forbidden. Mr. Whately also enjoins great caution in applying this remedy to persons advanced in years. Even when no objections of the above kind exist, the caustic should not be resorted to in the first instance. Mr. Whately maintains, that in every case of stricture, before venturing to employ the caustic, we ought to be able to pass into the bladder a bougie, of at least a size larger, than one of the finest sort. This isnecessary, both to enable us to apply the caustic to the whole surface of the stricture, and to relieve a retention of urine, should it occur during the use of the caustic.

When a bougie of the preceding description can be introduced, without occasioning pain, faintness, or great dejection of spirits, the use of caustic may commence immediately, when none of the above described objections exist.

When the urethra is very irritable, Mr. Whately recommends a common bougie to be introduced every day, and kept in the urethra; at first, for a few minutes only; but, by degrees, for a longer time; till the irritability of the parts has been sufficiently lessened.

When the urethra is rendered so impervious by a stricture, that a small bougie cannot be passed into the bladder, which viscus is also in a painful inflamed state, Mr. Whately asserts, that caustic, in any form, or quantity, must not be immediately employed; but, that the stricture should be first rendered capable of allowing a bougie a little larger, than one of the finest size, to be introduced into the bladder. When this is done, the urine is more freely evacuated, and the consequent irritation and inflammation of the bladder lessened, if not removed, together with the danger of a retention of urine. Caustic may then be advantageously conveyed into the centre of the stricture.

Mr. Whately considers the practice of at once thrusting down, in this sort of case, an armed bougie, considerably larger than the narrowest part of the contracted canal, as most dangerous, and horridly painful. For, says this gentleman, it frequently happens, that nearly the whole of the urethra anterior to the bulb is so much contracted by numerous and uncommonly rigid strictures, that, it is impossible, by any art whatever, to dilate the passage to its natural size. If, therefore, the canal, whilst in such a state, be rudely torn open by a large caustic bougie, hemorrhage, pain, dangerous suppressions of urine, inflammation, mortifition, and death itself, must sometimes inevitably ensue,—even before the caustic can be applied to the principal seat of the disease. In cases, like the one just mentioned, the first step, preparatory to the use of the caustic, should be, according to Mr. Whately, to dilate the strictured part of the urethra; for which purpose, he advises the slow and gentle introduction of a fine bougie, with its point inclined to the lower side of the canal, in order to avoid the large lacunæ, situated on its upper part. When the surgeon, by steady perseverance and dexterity, has succeeded in getting a fine bougie through the worst stricture into the bladder, the instrument should be worn, for a few hours, every day, till the passage is sufficiently dilated to admit a larger one.

Mr. Whately, after explaining, that the potassa fusa ought not to be applied to strictures of the urethra, till a bougie of a proper size can be passed into the bladder; after having pointed out the methods to be taken, before applying this caustic; and enumerated certain cases and circumstances, in which its employment is interdicted; next proceeds to describe the mode of practice, which it is the particular object of his book to recommend.

For the purpose of arming a bougie, Mr. Whately advises us to put a small quantity of potassa fusa upon a piece of strong paper, and to break the bit of caustic with a hammer into small pieces of about the size of large and small pins' heads. In doing this, care should be taken not to reduce it to powder. Thus broken, it should be kept for use in a phial, closed with a ground stopper. The bougie should have a proper degree of curvature given to it, by drawing it several times between the finger and thumb of the left hand.

Mr. Whately next acquaints us, that before the caustic is inserted into the bougie, it is necessary to ascertain the exact distance of the stricture, (to which the caustic is to be applied) from the extremity of the penis. For this purpose, the bougie, which should be just large enough to enter the stricture with some degree of tightness, ought to be gently introduced into the urethra; and when its point stops at the stricture, which it almost always does, before it will enter it, a notch is to be made with the finger-nail, on the upper or curved portion of the bougie, on the outside of the urethra, exactly half an inch from the extremity of the penis. When the bougie is withdrawn, a small hole, about the sixteenth part of an inch deep, should be made at the extremity of its rounded end. A large blanket-pin two inches and a half in length, with the head struck off, will answer the purpose; the hole being made with the point of the pin. The extremity of the bougie should then be made perfectly smooth with the finger and thumb, taking care, that, in doing this, the hole in its centre be not closed. Some of the broken caustic should then be put on a piece of writing paper, and a piece less in size, than the smallest pins' head, should be selected; the particle, indeed, says Mr. Whately, cannot be too small for the first application. Let this be inserted into the hole of the bougie with a pocket-knife, spatula, or some such instrument; and pushed down into it with the blunt end of the pin, so as to make the caustic sink a very little below the margin of the hole. To prevent the potassa fusa from coming out, the hole should then be contracted a little with the finger, and the remaining vacancy in it is to be filled with hog's lard. This last substance (continues Mr. Whately) will prevent the caustic from acting on the sound part of the urethra, as the bougie passes to the stricture. When the bougie is quite prepared, let it be first oiled, and immediately afterwards introduced, by a very gentle motion, with the curvature upwards, as far as the anterior part of the stricture, upon which the caustic is to be applied. In doing this, the end of the bougie, that is held by the finger and thumb, should be a good deal inclined towards the abdomen, on the first introduction of the instrument, in order to preserve its curvature. After it has passed about five inches, this end should be gradually brought downwards, as the bougie passes on, till it forms a right angle with the body. The bougie is known to have arrived at the stricture by the resistance made to its progress.

As soon as the bougie has reached the anterior part of the stricture, it should rest there for a few seconds, that the caustic may begin to dissolve. It should then be pushed very gently forward, about one-eighth of an inch; after which, there should be another pause, for a second, or two. The bougie should then be carried forward in the same gentle manner, till it has got through the stricture. The sense of feeling will generally inform the operator when the point of the bougie has proceeded so far; but, the notch in the bougie is to be an additional guide, by becoming very near the orifice of the urethra, when the end of the instrument has just got through the stricture.

The bougie should now be immediately withdrawn by a very gentle motion to the part, at which it was first made to rest awhile. Then it should be very slowly passed through the stricture a second time; but, without letting the bougie stop in its passage. If the patient complain of pain, or be faint, the bougie should be immediately withdrawn; but, if these effects are not produced, we may repeat the operation of passing and withdrawing the bougie through the stricture once or twice more, before we finish the operation, which will take up, in the whole, about two minutes.

The first application of the potassa fusa, in this manner, gives, according to Mr. Whately's account, a very little pain. A slight scalding in making water, and a trifling discharge, during the first day or two, however, are commonly produced.

At the end of seven days, the application of the caustic is to be repeated in the same manner. When the first application has enlarged the aperture of the stricture, which may be known by passing a bougie through it, of the same size as that by which the caustic was conveyed, the bougie used in the second operation, should be a size larger, than the one, used in the first; but it must not be too large to pass through the stricture. If the patient had no pain on the first application, the bit of potassa fusa may also be trivially larger. At the end of seven days more, the armed bougie should be introduced a third time. At this, and all future applications, the bougie should be increased in size, in proportion as the aperture in the stricture becomes dilated. The quantity of caustic, however, is never to be increased in a ratio to the size of the bougie. In no cases whatever, does Mr. Whately apply more of the potassa fusa at a time, than a piece about the size of a common pin's-head. Twelve bits of the largest size, which this gentleman ever uses, weigh one grain.

When there are several strictures, the potassa fusa should be generally applied to only one at a time.

An interval of seven days is what Mr. Whately generally allows to elapse between the applications of the caustic. The rule, however, may now and then be deviated from; but, the potassa fusa ought never to be re-applied, till the action of the last application has completely ceased. In a few instances, the interval may only be five days; in some others, it may be eight, nine, or even a longer space.

In the above method of using the potassa fusa, Mr. Whately represents, that this substance is equally diffused over every part of the strictured surface, and only *abrades* the membrane of the stricture, without producing a slough. The *degree* of this abrasion, he says, may be increased, or lessened, as circumstances dictate, by paying attention to the quantity of the caustic.

The foregoing account will suffice for conveying an adequate idea of Mr. Whately's method. I am sorry I cannot add my favourable opinion of the practice. To *abrade*, without destroying, is to me perfectly unintelligible. Nor can I conceive, that a liquid caustic (for so it is represented as becoming) can be applied with the accuracy to strictures, which Mr. Whately seems to suppose happens. This however is merely my own sentiment; and I do not wish to conceal that there are yet a few surgeons who believe, that Mr. Whately's plan is the most eligible for all cases, in which the stricture is irritable, or far advanced. (See *Howship's Pract. Obs. on the Diseases of the Urinary Organs, p.* 207.)

Upon the whole I may safely declare, that caustic bougies are now much less frequently used by the best surgeons in London, than they were about ten years ago. Several distinguished practitioners, who to my knowledge were then accustomed to recommend and employ them, have at present returned either to the use of common bougies, or those made of flexible metal or elastic gum, to which after many comparative trials, I acknowledge, a general, but not universal, preference seems to me to be due. We learn from M. Roux, that caustic bougies never had many advocates in France; and the enquiries, which he made when he was in London, authorized him to announce to his countrymen after his return, that such instruments are at present not more recommended here, than they are at Paris. (See *Voyage fait à Londres ou* 1814, *ou Parallèle de la Chirurgie Angloise, &c. p.* 315.)

Cases of stricture however, where the disease is far advanced, of long standing, and attended with such obstruction, that no kind of common bougie can be introduced, appear to me to be the examples, in which the employment of bougies, armed with the nitrate of silver, ought principally to be continued. This mode is certainly less violent, than that of employing a common bougie with sufficient force to make its way through the stricture by exciting ulceration. It must also be attended with less risk of rupturing the urethra, and producing a false passage. I have already explained, that the armed bougie has likewise been particularly recommended for what has been termed the *irritable* stricture.

The works, which contain the chief information on the subject, which we have just been treating of, are: *A Treatise on the Venereal Disease, by John Hunter. Practical Observations on the Treatment of Strictures in the Urethra and Œsophagus, by Sir Everard Home, in* 2 *vols. An improved Method of treating Strictures in the Urethra, by Thomas Whately, Edit.* 2, 1806.

*The following works may likewise be consulted: Howship's Practical Obs. on the Diseases of the Urinary Organs, particularly those of the bladder, the prostate gland, and urethra,* 8*vo. Lond.* 1816. *Soemmering Abhandlung über die Schnell und Langsam tödtlichen Krankheiten der Harnblase und Harnrohre bey Männern im hohen alter.* 4to. *Frankf.* 1809. *Letters concerning the Diseases of the Urethra, by C. Bell,* 1810.

**URETHRA, FALSE PASSAGE IN.** One of the worst consequences, of using catheters, and bougies, in an improper manner, is the rupture of the urethra, or the formation of a false passage by ulceration. With bougies, this accident is generally occasioned by trials to excite ulceration by the application of the end of the bougie to the stricture, when this instrument cannot be passed through it. When once the new passage has been formed, whenever the bougie is introduced, it cannot be hindered from going into the false track, and its action on the stricture is altogether frustrated.

Mr. Hunter has advised the following operation to be practised in this kind of case. Pass a staff, or any such instrument into the urethra, as far as it will go, which will probably be to the bottom of the new passage, and this, we may be certain, is beyond the stricture. Feel for the end of the instrument externally, and cut upon it, making the wound about an inch long, if the disease be before the scrotum; and an inch and a half, or more, if in the perineum. If the new passage be between the urethra and body of the penis, you will most probably get into the sound urethra, before you come to the instrument, or new passage. If so, introduce a probe into the urethra, through the wound, and pass it towards the glans penis, or, in other words, towards the stricture. When it meets with an obstruction, this must be the stricture, which is now to be got through, and afterwards dilated. To complete the operation, withdraw the probe, and, instead of it, introduce a hollow cannula forwards to the stricture. Then introduce another cannula from the glans downward, till the two tubes are opposite each other, having the stricture between them. An assistant is now to take hold of the urethra on the outside, with his finger and thumb, just where the two cannulæ meet, in order to keep them in their places. Through the upper cannula next introduce a piercing instrument, which is to perforate the stricture, and enter the lower cannula. The piercing instrument is now to be withdrawn, and a bougie introduced through the first cannula and stricture, into the second cannula. The tubes are to be withdrawn, and the end of the bougie, in the wound, directed into the bladder, through the further portion of the urethra. It may also be necessary to lay the whole of the false passage open, in order to make it heal; for otherwise, it might still obstruct the future passage of bougies into the proper canal.

When the new passage is between the skin and urethra, the surgeon must extend his incision more deeply, for the purpose of finding out the natural passage. Then he is to proceed as above explained.

The longer the first bougie is allowed to remain in the canal, the more readily will the second pass. The bougies must be gradually increased in size, and used till the wound is healed. The only improvement, which seems proper to be made in this plan, is to employ hollow bougies, or flexible gum catheters, which might be worn longer than common bougies, as the patient could void his urine through them. (See *Hunter on the Venereal Disease.*)

**URINARY ABSCESSES.** Extravasations of urine may be in three different states. This fluid may be collected in a particular pouch; it may be widely diffused in the cellular membrane; or, lastly, it may present itself in a purulent form, after having excited inflammation and suppuration in the parts, where it is situated. This case is termed by the French writers an urinary abscess.

Such extravasations of urine always imply a rupture in some of the excretory passages for this fluid, either in the kidnies, or ureters, the bladder, or the urethra. This solution of continuity may be produced by a variety of causes. It is most frequently the effect of a forcible distention of these passages, in consequence of a retention of urine. Phlegmonous abscesses, formed in the thickness of the parietes of these passages, or along their course, may also occasion this rupture, by bursting internally. The solution of continuity may also be produced by a sword, or another foreign body that has penetrated the parts. There are likewise examples of effusions of urine depending upon the displacement of the cannula of the trocar, after the operation of puncturing the bladder. Several have been noticed, (and, indeed, they are very frequent) caused by false passages in the urethra; and we have cases of similar effusions, following violent contusions of the perineum, attended with laceration of the urethra.

In *Les Œuvres Chirurgicales de Desault par Bichat, Tom.* 3. it is further observed, that the ravages, which the urine makes when out of its natural receptacles, are usually greater, and more extensive, when this fluid is extravasated in the cellular membrane, than when it is effused into a particular pouch. The mischief is also less, when the excretory passage is free, than when it is closed by any obstacle, as in cases of retention. The more or less loose texture of the parts, in which such effusions happen, likewise makes a considerable difference in their progress and formation. With regard to the place, which they occupy, it is ordinarily determined by the situation of the rupture, by which the urine has escaped. When the pelvis, or infundibulum of the kidney, or the upper part of the ureter, gives way, the urine is commonly effused in the loins and the fossæ iliacæ, between the peritoneum and the adjacent parts. When the lower part of the ureter, or the bladder, near its lower portion, gives way, the extravasation is generally included within the pelvis.

But, when the rupture occurs in the anterior parietes of the bladder, near its upper part, and, especially, when it takes place at a time, when this organ is extremely distended and dilated, the urine becomes effused behind and above the pubes, sometimes ascends to the epigastric region, between the peritoneum and the abdominal muscles, and, after having followed the course of the spermatic vessels, it often makes its exit at the ring, and is extravasated in the groins and scrotum. If the rupture has happened in the urethra, the most common situation of the effusion is in the perineum and scrotum. The extravasation frequently extends to the penis and upper part of the thighs, and even sometimes propagates itself, under the skin of the abdomen, up to the hypochondria and sides of the chest. Such is the ordinary course of the urine, when extravasated out of the parts, which are destined to contain it; but, the slightest circumstance may alter this course, and produce sinuses in several other parts of the body.

In the animal economy, there is no fluid, the extravasation of which is so fatal, as that of the urine. If it is not promptly discharged, it soon excites a putrid suppuration in the cellular membrane, which contains it, makes this part slough, causes a gangrenous inflammation of the skin, and almost always produces a mortification of the parts, amongst which it flows.

While the extravasation of urine is confined to the interior of the pelvis, and lumbar and iliac regions, without manifesting itself externally, there is no certain sign of its existence. The circumstances, which may be recollected, however, joined with the symptoms, which the patient complains of, may lead to a suspicion of the extravasation. Thus, when in consequence of a retention of urine in the ureters, or bladder, the patient has suddenly experienced great relief, without any of the urine having been discharged the natural way; when he has at the same instant felt a kind of pricking in the loins, or pelvis; when to the ease, which lasted only a few hours, symptoms, more severe than the former ones, have succeeded, such as ardent fever, hiccough, vomiting, &c. there is reason for believing, that an internal extravasation has happened. The uncertainty in the diagnosis is here not much to be lamented, since art can do nothing for this kind of disorder, and, if there were the clearest proofs of its existence, we should be equally compelled to abandon the patient to the resources of nature, whose efforts are almost always ineffectual.

This uncertainty in the diagnosis disappears as soon as the extravasation becomes apparent externally. The case is then announced by symptoms, which hardly ever deceive. The preceding retention of urine; the sudden appearance of the swelling caused by this fluid; the rapid progress of this tumour; the kind of crepitation perceptible in it, like that which occurs in emphysema; the tension of the œdematous shining skin, as in leucophlegmasia; the diminution of the symptoms depending upon the retention; such are the first occurrences, which are observable, when the extravasation is somewhat considerable.

If the patient is not speedily assisted, and the urine continues to be extravasated, the tumour spreads more and more; the skin assumes a red violet colour; gangrenous eschars are formed, the separation of which gives issue to a very fetid sanies, in which the smell of urine is readily distinguishable. Portions of dead cellular membrane are presently discharged together with the sanies; the ulcer grows larger; and the dressings are continually wet with the urine.

The indications to be fulfilled are not the same in all cases of extravasations of the urine; they vary according to the situation of the breach of continuity in the urinary passages, and the particular situation and extent of the effusion. When the rupture has happened in the ureters, and an urinary abscess is formed in the loins, the aid to be derived from surgery is limited to making an opening in the extravasation, as soon as it can be felt externally. It is then not in the power of art to re-establish the natural course of the urine, or to hinder this fluid from passing through the wound, and rendering it fistulous. However, there are some circumstances, in which a radical cure may be effectually attempted. For example, if the abscess were produced by a calculus lodged in the infundibulum, or ureter, and it could be felt, and taken hold of with a pair of forceps, introduced into the opening, the extraction of the foreign body might promote the healing of the ulcer, by rendering the natural channel for the urine free.

When the opening, by which the urine has become extravasated, exists in the bladder, or urethra, one indication, that does not present itself in the foregoing case, may be fulfilled, viz. the urine may be drawn off by means of a catheter passed into the bladder, and kept there. By this means, we not only immediately stop the progress of the extravasation, but attack the very cause of the malady, by removing the obstacles, which oppose the natural course of the urine. The introduction of the catheter then becomes a matter of the most urgent necessity. This operation is often attended with the greatest difficulties. Besides the ordinary obstruction of the canal, we have also to surmount the obstacles, which the urinary swellings situated in the course of the urethra, create to the passage of the instrument. When these tumours are considerable, they ought to be opened before the catheter is employed. The subsidence of the swellings would render catheterism more easy. Besides, Bichat and Desault were assured by daily experience, that with a little skill, exercise, and patience, the catheter may always be got into the bladder. If, however, the thing could not be done, ought we to puncture the bladder, or have recourse to the operation termed by the French boutonnière?

Desault was an advocate for neither of these proceedings: he thought it was a more simple and beneficial practice merely to make an external opening in the collection of effused urine. This measure would both afford an outlet for the urine, and arrest the extension of the extravasation. Besides, such an opening is often indispensably requisite for the purpose of putting a stop to the symptoms depending upon the effusion and stagnation of the urine. But, if the catheter can be introduced, there may be cases, in which an opening would not only be useless, but hurtful; for instance, when the swelling, caused by the urine, is of little extent, or when it is situated in the thickness of the parietes of the passage, or along its track, it almost always admits of dispersion by the simple employment of the catheter. It seldom happens, however, that this swelling, however small, ends in resolution; it almost always suppurates; but, as it breaks into the urethra, the matter escapes between this canal and the catheter, and renders the making of an external opening needless. Experience teaches us, also, that when the tumour is situated in the scrotum, or between the root of the penis and the symphysis pubis, even after the healing of the incisions, made in these situations, a fistula will often remain, which is very difficult of cure. With the exception of these particular cases, Desault was an advocate for opening all urinary abscesses.

The manner of opening such collections varies according as the urine may be in one cavity, or widely effused in the cellular membrane. In the first case, a simple incision, the whole length of the cavity, will suffice for emptying and healing it. In the second, if the extravasation is extensive, the incisions must be multiplied. It would be absurd to spare the parts; for, all those, with which the urine has come into contact, seldom escape mortification. The incisions, which are made, hardly ever have the effect of saving them; but, by accelerating the discharge of putrid sanies and stagnant urine, they prevent the mischief, which would originate from their further lodgment. If these incisions, however, were practised a few hours after the extravasation, and before suppuration, the parts might be completely freed from urine and preserved. When the operation is at all delayed, their destruction is inevitable. The approach of mortification is indicated by the crepitation under the bistoury, resembling the kind of noise produced by tearing parchment. The extent and depth of the incisions must be proportioned to those of the abscess. When the extravasation occupies the scrotum, long deep scarifications should be made in that part, as well as in the skin of the penis, and in every place, where the urine is effused.

Practitioners, unaccustomed to see such diseases, would be alarmed at the extent of the sore produced by the separation of the eschars. Sometimes, the whole scrotum, skin of the penis, and that of the groins, perinæum, and upper part of the thigh, mortify, and the naked testicles hang by the spermatic cords, in the midst of this enormous ulcer. It is hardly conceivable how cicatrization could take place over the exposed testicles; but, the resources of nature are unlimited. She unites the testicles and the cords to the subjacent parts, and drawing the skin from the circumference to the centre of the ulcer, she covers these organs again, and furnishes them with a sort of new scrotum. This statement is founded upon numerous cases, in which nature always followed this course. The cicatrization of the ulcer is even more expeditious, than might be apprehended, considering its extent. In all this business, what does art do? If the introduction of the catheter is excepted, which, indeed, is absolutely necessary for the radical cure, her assistance is very limited, and almost nothing, in the generality of instances; for, when the patients are not exhausted by the tediousness of the disorder, when they are of a good constitution, and in the prime of life, they get well as quickly and certainly, with the aid of a good diet and simple dressings, as when they take internal medicines, and use a multiplicity of compound topical applications. The practice of Desault at the Hôtel-Dieu consisted in applying emollient poultices, until the sloughs were detached. The ulcer was then sometimes dressed with pledgets charged with styrax; but frequently mere dry lint was used, and continued till the cure was completed. If any complication occurred in the course of the treatment, suitable remedies were prescribed for it. Thus when prostration of strength, and tendency to sloughing existed, bark, cordials, and antiseptics were ordered. But, in every case, the catheter is the essential means of cure; without it, the treatment is almost always imperfect, and the ulcer will not heal, without leaving several urinary fistulæ. (See *Œuvres Chirurgicales de Desault par Bichat, Tom. 3, p.* 277—287.)

**URINARY CALCULI.** The causes of the precipitation of the salts, which the urine holds in solution, and of the formation of urinary calculi, are totally unknown. The conjectures, which have been entertained upon this subject, respecting the effect of certain kinds of food, drink, air, &c. do not appear to be built upon any good foundation. According to Delpech, the following is all the exact knowledge that we have upon this interesting topic.

1. If a foreign body be introduced into a cavity, which is naturally a receptacle for the urine, whatever may be the nature of the immersed substance, it is sure to become incrusted with the urinary salts, without any change, however, in its composition. In this case, there is manifestly no chemical combination, but merely an irregular precipitation of the saline particles, in consequence of the attraction of aggregation. Nor is there in this instance the least reason for suspecting the operation of any peculiar diathesis in producing the calculus, since the introduction of the foreign body, which forms the nucleus for it, occasions the same consequence in all descriptions of patients.

2. There are countries, where calculi are exceedingly common: others, where the formation of these extraneous substances is very rare; and yet one cannot explain the difference by any geographical circumstance, which is constant; nor by any remarkable particularity in the constitution of the inhabitants.

3. Calculous patients may likewise be perfectly healthy in every other respect, if the effects of the calculi have not materially injured the urinary organs.

4. Subjects, gifted with the strongest constitutions, are liable to urinary calculi, quite independently of the accidental introduction of any foreign body into the urinary organs. In these cases, probably, the origin of the complaint may be ascribed to a particular diathesis not at all understood.

5. A sort of connexion between gout, the formation of urinary calculi, and hemorrhoids, has been suspected, and these complaints have been thought frequently to succeed, and, as it were, mutually replace each other. The cases on record tending to such a conclusion are not numerous, and as they are not sufficiently uniform in their progress and results, the inference is not clear, nor even probable. The observations only prove the concurrence of those affections in the same individual. Besides, this pretended analogy seems rather to be founded on a forced resemblance of gouty concretions to urinary calculi, than upon direct observation; but, analysis demonstrates, that these substances are totally different in their composition.

6. It is alleged, that women are less subject than men, to urinary calculi; but our researches upon this subject still leave it doubtful, whether women are in reality less liable to the disorder, or only suffer less frequently from it, in consequence of the facility with which the calculi are generally discharged through the short and capacious urethra of the female subject.

7. Childhood and infancy present numerous instances of urinary calculi; but, at these periods of life, relapses are seldom observed; that is to say, an entirely fresh stone is hardly ever formed again. If a return of the complaint happens, the quickness of the recurrence, and an attentive examination of the calculus, will in general sufficiently prove, either that the stone has formed round a fragment, which had not been extracted in the previous operation, or that it was already completely formed at the same period.

8. Youths and adults are very seldom troubled with calculi, even though they may have been thus afflicted in their infancy or childhood.

9. Old men are much more liable to the disorder; and, in them, the disposition to it continues throughout life. Hence, relapses in such patients are very common.

10. Chemical analysis has proved, that urinary calculi contain and have for their basis a kind of animal matter, besides different salts, the bases of which are lime, ammonia, magnesia, soda, and silica, and a peculiar acid, termed *uric*, or *lithic*. There is no urinary calculus, in which such animal matter cannot be found, having the size and shape, which the calculus itself had previously to its dissolution. (*Delpech, Précis Elementaire des Maladies Chir. Tom.* 2, *p.* 193, *&c.*)

Authors usually divide urinary calculi into those, which are situated in the kidneys, or ureters and termed *renal*, and into others, which are lodged in the bladder, and called *vesical*. The symptoms and treatment of cases of calculi in the kidneys and ureters are rather medical, than surgical subjects, and I shall therefore not describe them in the present article. Some reflections, however, upon the operation for the extraction of renal calculi, have not been omitted. (See *Nephrotomy.*)

It is thought, that the greater number of urinary calculi originate from concretions formed in the kidneys, and brought down into the bladder by the ureters. The cases, however, in which the calculi are formed round foreign bodies, introduced into the bladder through the urethra, the digestive organs, or some accidental wound, must be regarded as exceptions to the preceding observation. In the centre of urinary calculi, surgeons have often met with bullets, splinters of bone, bits of wood, pins, &c. It is not necessary for such foreign bodies to be large, in order to produce this effect: a clot of blood, or a little bit of straw, is sufficient to cause a precipitation of the urinary salts, if it be not very soon voided.

A urinary calculus, thus produced, is always single, unless several foreign bodies have been introduced into the bladder. But, when urinary calculi originate from a particular diathesis, several are often present together. Several distinct nuclei may descend successively from the kidneys, and each may attract new depositions, and separately increase. Sometimes, however, several calculi, which at first were separate, are afterwards cemented together, so as to constitute only one.

The magnitude of urinary calculi is generally in an inverse ratio to their number. Some hundreds have been found in the same bladder; but, they were not larger than a pea. Others of so large a size have been met with, that their greatest diameter was more than six inches. Their average size may be compared with that of a chesnut, a walnut, or small hen's egg. Their weight differs from a few grains to upwards of fifty ounces. Common urinary stones, however, weigh from two to six ounces. Their weight is not always proportioned to their size. Substances of different qualities may enter into their composition, and diversify their heaviness. Thus, the salts, which have silica for their base, are seldom met with; but, the calculi, which contain them, are much the heaviest, in proportion to their size. On the other hand, some urinary salts crystallize, when precipitated: of this kind is the *ammoniaco-magnesian phosphate;* and the crystals of this salt, when they form a thick layer, intercept spaces, which are not filled up by the subsequent precipitations. (*Delpech, T.* 2, *Sect.* 5.)

Dr. Wollaston has divided urinary calculi into four species. 1st. The uric acid concretion. 2d. The fusible calculus, or phosphate of ammonia and magnesia. 3d. The mulberry calculus, or that consisting of oxalate and phosphate of lime. 4th. The bone-earth calculus, or that composed of the phosphate of lime.

To these, as we have already stated, must be added another less frequent sort containing silica.

The urinary salts in calculous patients are not always precipitated in the same quantities: indeed, in some cases, the process appears to be suspended, even for a considerable time. Hence, a stone of middling size, already formed, may increase but very slowly; and if the mucous membrane of the bladder be not extremely sensible, the foreign body may only produce slight inconveniences. Thus, a calculus, which could be felt with a sound, has been known to continue more than ten years in the bladder, and after all this time be only of a moderate size. (*Delpeck, Précis Elémentaire, &c. T.* 2, *p.* 222.)

As the same well informed surgeon notices, some examples of the curative efforts of nature, which have occasionally proved successful, can be adduced. A stone of small size is mostly propelled towards the neck of the bladder, especially when the urine is discharged with celerity; and it has often happened, that the foreign body has been carried into the urethra, through which it has passed, with more or less facility, and been voided with the urine.

Delpech has even cited instances, in which the stone has made its way by ulceration into the vagina, and rectum, or through the perineum. Such cases, however, do not appear to have been examined very particularly; and Delpech is inclined to think, that if a proper investigation had been made, it would have been discovered, that the calculi did not escape from the bladder by ulceration of any part of its fundus, but, that they first passed a little beyond the neck of the bladder, into the urethra, where they lodged, and increased in size until they produced ulceration, or sloughing of the parts.

It has been conjectured, that urinary calculi may sometimes be more or less acted upon by the absorbents; but, there are no instances on record proving, that a stone, indisputably present in the bladder, was ever removed in this way. Nor is it proved, that the properties of the urine ever spontaneously undergo such a change, as will bring about the dissolution of a calculus.

Attacks of pain in the kidney, followed by the usual symptoms of a passage of a renal calculus into the bladder, and then by difficulty and pain in making water, make it probable that the bladder contains a small stone, which may not readily admit of being felt with the sound. When, however, a foreign body is known to have got into the bladder, the diagnosis will be attended with greater certainty. If, under these circumstances, the evacuation of the urine should be suddenly obstructed, and acute pain be felt at some point of the urethra, the calculus has probably entered this passage, and nature is endeavouring to expel it again. Certain information, however, may be immediately acquired by the introduction of a sound. In this sort of case, the impetus of the stream of urine may be augmented, and the resistance of the parietes of the urethra lessened, by mucilaginous drinks, and the warm bath. At the same time, suction, oily injections, and attempts at extraction with wire-nooses, hooks, forceps, &c. have been advised. But, these mechanical means, as Delpech observes, are always attended with danger and uncertainty. The other means, however, may be tried, as long as the accumulation of urine is not very considerable; but, when further delay would be attended with excessive distention of the bladder, or risk of the rupture of its parietes, or those of the urethra, the surgeon ought at once to make an incision directly upon the calculus and extract it.

When a small calculus is known, or strongly suspected, to be in the bladder, but it does not spontaneously pass into the urethra, Delpech recommends dilating the passage to the utmost with elastic gum catheters, then a considerable quantity of urine is to be allowed to collect in the bladder, the catheter is to be suddenly taken out, and the patient to make water in as strong a stream as he can. A pin, which had got into the bladder, has been extracted, after long and patient trials, by entangling it in the eye of the catheter. Delpech conceives, that the simple dilatation of the urethra would probably have had the same result.

These means for promoting the natural expulsion of urinary calculi, it is obvious, can only answer when these foreign bodies are very small, excepting in women, in whom the practice may be carried to a greater extent.

As the symptoms of a stone in the bladder are detailed in another part of this Dictionary, it will only be necessary in the present place to refer the reader for information upon that subject, to the article *Lithotomy*, where some observations on encysted calculi will also be found.

The stone being a most severe affliction, and the operation extremely hazardous and painful, a variety of experiments have been instituted, for the purpose of discovering a solvent for urinary calculi. Hitherto, however, all the remedies and plans, which have been tried, have been attended with very limited, and, by no means, unequivocal success, notwithstanding many persons may have been deceived into a contrary opinion.

The dissolution of stones in the bladder has been attempted by lithontriptic medicines, as they have been termed, and by fluids injected into this viscus.

From the experiments of Fourcroy, it appears, that almost every ingredient in calculi is dissolved by the caustic alkali; and various experiments have shewn, that the whole calculus yields to its powers. Limewater has also been found to be a solvent of urinary calculi out of the body. It is obvious, however, that what is taken by the mouth is subject to many changes in the alimentary canal, and also the lymphatic, and vascular systems, and that, in this way, it must be exceedingly difficult to get such substances, (even were they not liable to alterations) in sufficient quantity into the bladder.

Lime was long ago known to be a solvent of urinary calculi, and different methods were employed to administer it with safety. One of these plans fell into the hands of a Mrs. Steevens, and her success caused great anxiety for the discovery of the secret. At last, Parliament bought the mystery for £5000. In many instances, stones which had been unquestionably felt, were no longer to be discovered; and, as the *same* persons were examined by surgeons of the greatest skill and eminence, both before, and after, the exhibition of the medicines, it is no wonder, that the conclusion was drawn, that the stones had been really dissolved. From the cessation of such success, however, and from its now being known, that stones occasionally become lodged in a kind of cyst, on the outside of the general cavity of the bladder, so as to cause no longer any material suffering, surgeons of the present day are inclined to suspect, that this must have happened in Mrs. Steevens's cases. This was certainly what happened to one of the persons on whom the above medicine was tried, as Dr. W. Hunter informs us. It is evident, that a stone, so situated, would not in general produce a great deal of irritation, nor admit of being felt with a sound; though, as I have stated in the article *Lithotomy*, there have been a few exceptions to this observation.

Mrs. Steevens first gave calcined egg-shells alone; but, finding costiveness produced, she added soap. In time, she rendered her process more complicated, adding snails burnt to blackness, a decoction of camomile flowers, parsley, sweet fennel, and the greater burdock.

As soap was with reason supposed to increase the virtues of the lime, it led to the use of the caustic alkali, taken in a mucilage of veal broth. Take of kali prepared, ℥viij; of quick-lime ℥iv; of distilled water ℔ij. Mix them well together in a large bottle, and let them stand for 24 hours. Then pour off the ley, filter it through paper, and keep it in well stopped phials for use. Of this the dose is from 30 drops to ʒij, which is to be repeated, two, or three times a day. Mix the quantity to be used in the day, with three pints of plain broth, made of the lean part of veal, all the fat, or oily parts being separated from the liquor, by skimming them off when cold. Let the patient drink, within an hour, a pint of this broth three times a day; early in the morning, at noon, and in the evening. Continue this plan, for three or four months, living, during this course, on such things as least counteract the effect of the medicine. The common fixed alkali, or carbonated alkali, and the acidulous soda water, have of late been used as lithontriptics. Honey has also been given, and Mr. Home, surgeon at the Savoy, has recorded its utility in his own, and his father's cases. Bitters have likewise been tried.

Of the soap, as much may be taken as the stomach will bear, or as much as will prove gently laxative; but, of the lime-water few can take more than a pint daily.

The acidulous soda water may be taken in larger quantities, as it is more agreeable. The acidulous salt is now prepared so as to produce this water extemporaneously. It must be swallowed, however, while the salt is dissolving; as the carbonic acid gas escapes with great rapidity.

On the whole, I believe, reason and experience will not allow us to consider limewater, soap, acidulous soda water, caustic alkali, and bitters, as any thing more than palliative remedies, by which the pain of the disorder may be sometimes diminished. For, according to my notions, it seems more rational to impute the few supposed instances of greater success to the calculi becoming encysted.

Medicines, taken into the stomach, having failed to dissolve urinary calculi, solvent injections have been introduced through a catheter directly into the bladder. Fourcroy and Vauquelin ascertained, that a ley of potassa, or soda, not too strong to be swallowed, softens and dissolves small calculi, composed of the uric acid and urate of ammonia, when they are left in the liquid a few days. They have proved, that a beverage, merely acidulated with nitric or muriatic acid, dissolves, with still greater quickness, calculi, formed of the phosphate of lime, and of the ammoniaco-magnesian phosphate. They have ascertained, that calculi, composed of the oxalate of lime, which are the most difficult of solution, may be softened, and almost quite dissolved, in nitric acid, greatly diluted, provided they are kept in the mixture a sufficient time.

We are then acquainted with liquids, which will dissolve calculi of various compositions; but, much difficulty occurs in employing them effectually in practice. For, although we can easily inject them into the cavity of the bladder, this organ is so extremely tender and irritable, that it cannot bear the contact of any fluid, except that which it is destined by nature to contain, and the action of such liquids upon it, as would be requisite for dissolving a stone in its cavity, would produce sufferings, which no man could endure, and the most dangerous and fatal effects on the bladder itself. Another objection to this practice also arises from the surgeon never knowing what the exact composition of a calculus is, before this body is extracted, and his consequent inability to determine what solvent ought to be tried. Upon this, however, it is unnecessary to lay much stress, since if the previous, more weighty objections were done away, the latter difficulty, might, perhaps, be obviated.

URINARY FISTULÆ. By an urinary fistula, strictly speaking, is implied a deep, narrow ulcer, which leads into some of the urinary passages: but, this name is likewise applied to sinuses, which without having any communication with these passages, terminate near some point of their course. Thus, in Desault's works (*Tom.* 3, *p.* 287), three kinds of fistulæ, in respect to the urinary passages, are noticed. The first sort is called a *blind external fistula,* because it opens only externally; the second, *blind internal,* because it has only one opening into the urinary passages; the third, is termed *complete,* being attended both with an internal opening into the urinary organs, and one or more external apertures.

Amongst the blind external fistulæ, only such as terminate near the canal of the urethra are particularly noticed in Desault's works. All fistulæ of this kind are originally owing to an abscess, that has formed in the vicinity of the urethra; and, in the article, *Urinary Abscesses,* it has been explained, that these suppurations frequently originate from disease of that canal. Whatever may be the cause of these fistulæ, however, it is not unusual to find, that, after the pus has made its way towards the scrotum or perineum, and discharged itself outwardly, the ulcer is converted into a sinus, which resists all the efforts of nature to heal it. According to Desault, this kind of fistula may be kept up by a thinning and denudation of the parietes of the urethra; a very common disposition, when the abscess is situated about the root of the penis, and towards that part of the canal, which is situated over the scrotum, in consequence of the weight of this latter organ tending incessantly to separate it from the urethra. The opening of the fistula being too small; its orifice higher than its bottom; and its track being narrow and tortuous; may likewise occasion sinuses, and render the sore difficult to cure, by opposing the free exit of the matter. It may also be complicated with hardness and callosities, caries of the bones of the pelvis, disease of the tendons of the muscles of the perineum, &c. It is known, that these different complications operate as so many obstacles to the cure of sinuses. It is easy to distinguish these kinds of fistulæ from such as terminate near the rectum. Besides the symptoms which may be remembered to have occurred, and which are sufficient to point out the difference; a hardness, resembling a cord, that appears to run towards the urethra, may be felt when the finger is passed along the fistulous track. A probe, introduced into the fistula, follows the direction of this cord, and is at last stopped by the parietes of the urethra. It may also be ascertained, that the sinus has no communication with the urethra, by the following considerations: 1. No urine has escaped from the fistula, nor any purulent matter from the urethra. 2. A probe, when introduced into the sinus, cannot be made to touch a catheter passed into the urethra. These symptoms, however, are not infallible; for, in complete fistulæ, it sometimes happens, when the internal opening is small, and there is no obstruction in the urethra, that the whole of the urine is discharged through this canal. Frequently, also, the probe is stopped in the tortuosities of the fistulous track, and, when pushed against the parietes of the urethra, it does not always penetrate the internal opening, especially when this is small, and it is situated in some point of the denuded portion of the canal, that does not correspond to the direction of the fistula. The issue of a larger quantity of pus, on slight pressure being made along the canal, leaves no doubt of the existence of sinuses. With respect to other complications, such as callosities, caries of the bones, &c. they may be readily ascertained by their proper symptoms.

The indications to be fulfilled in the treatment of these fistulæ, depend upon a knowledge of the different complications. When the sinuses are kept up by a separation of the scrotum from the parietes of the urethra, Desault recommends exact compression to be made over the part, which method, he says, is sometimes sufficient to accomplish a cure. When this plan fails, he states, that the healing of the sinus may be promoted by practising an incision on one side of the scrotum, and carrying it as far as the denuded portion of the urethra. When sinuses exist, and they depend upon the smallness of the opening, or its unfavourable situation for the discharge of the matter, the aperture should be enlarged by making an incision into the main collection of pus. When there are callosities, which resist cataplasms, and the most active resolvents, Desault advises us to introduce into the fistulæ, trochees of minium, for the purpose of destroying the indurated parts. When the bones are carious, and the tendons diseased, exfoliation must be awaited; and, in every instance the treatment should vary, according to the cause, upon which the fistula depends.

Incomplete internal urinary fistulæ, or, in other words, blind internal fistulæ, are seldom met with in the ureters and bladder. The quality of the cellular substance, which surrounds these parts, favours the effusion of the urine too much for the disorder, arising from a breach of continuity in them to be confined to a simple internal fistula. Such fistulæ, however, are often met with in the urethra. The bursting of an abscess into this canal; the rupture of the same canal in consequence of a retention of urine; a false passage; the healing of the external part of the wound made in lithotomy, while the internal part is not united; are all so many causes of this disease.

The diagnosis of these fistulæ is deducible from circumstances, which may be recollected; together with a discharge of pus from the urethra, before, and sometimes after the issue of the urine; the pressure of a tumour in the course of the urethra, which tumour increases while the patient is making water, and afterwards disappears by pressure, attended with a fresh discharge from the penis of matter blended with urine. This symptom alone is characteristic; for, an old gonorrhœa, complicated with indurations, may also keep up suppuration of the canal. The existence of pain gives no positive information; and nothing certain can be ascertained by the introduction of the catheter. It is true, the beak of this instrument may become entangled in the fistula; but, its entrance into the bladder may equally be opposed by a variety of other obstacles.

These internal urinary fistulæ cannot be cured, except by preventing the urine from getting into them and lodging there. The catheters employed should neither be too large, nor too small. If too large, they would exactly fill the canal, and the pus and urine contained in the fistulæ could not be discharged. If too small, the urine would insinuate itself between them and the sides of the urethra, and enter the fistulæ. Such inconveniences may be avoided by using a catheter of moderate size. Its employment must be continued till the ulcer is entirely healed. The inutility of medicated bougies, and other internal and external remedies, is too manifest to need any comment.

Of all urinary fistulæ, there are none more frequent than those which are termed *complete.* Their origin may be in the ureters, bladder, or urethra. Those which arise in the ureters, sometimes terminate in the colon, and the urine is discharged *per anum* mixed with the feces. But, most commonly, these fistulæ make their appearance externally, either in the lumbar, or inguinal regions. Those which communicate with the bladder, have also different terminations. When they proceed from the upper and interior part of this organ, they ordinarily pierce the parietes of the abdomen above the pubes, and towards the navel. They also sometimes terminate in the groins. When they originate in the posterior parietes of the bladder, they sometimes tend into the cavity of the abdomen, where they almost always prove mortal; and sometimes into the intestines, if there should be adhesions between these and the bladder so as to favour this communication. When the opening in the bladder is near the bottom of this viscus, the fistula sometimes terminates in the rectum of the male, and the vagina of the female subject; but, most frequently, it ends in the perineum, in both sexes. With regard to the fistulæ, which originate in the urethra, they usually open externally in the perinæum, the scrotum, or the penis, and sometimes also in the rectum. It is not uncommon to see the external opening of these fistulæ at a great distance from the internal one, and to find it in the middle, and even the lower part of the thighs, the groins, parietes of the abdomen, and as high as the sides of the chest. Often there is only one opening in the urethra, while there are several situated externally, more or less distant from one another.

Most of these fistulæ are the consequences of a retention of urine, and are owing to the same causes, as the diseases of which they are a symptom. Those which communicate with the rectum, in the male subject, sometimes depend upon this intestine having been wounded in the operation of lithotomy; and those, which open into the vagina, are often the effect of a violent contusion, caused by the head of the child in difficult labours, or of ulceration produced by pessaries, which are too large, and the margins of which are too sharp and irregular. Carcinoma of the rectum and vagina also give rise to fistulæ, by extending into the bladder.

The discharge of urine from the external orifice of the fistula is an unequivocal proof of its communication with the urinary passages; but this symptom does not always exist, and, it often happens, that, when the fistula is narrow, and there is no obstruction in the urethra, the urine more readily escapes the latter way, than through the fistula. The kind of cord, which is felt in the track of the fistula, and which extends towards the urethra, is a very uncertain criterion of the communication with this canal. This symptom is common to all fistulæ complicated with callosities, whatever may be their nature in other respects. The fungus, which sometimes appears round the external orifice, is also observed in fecal fistulæ. The situation of this outer aperture scarcely affords any presumption on the nature of the fistula, since, in numerous cases, this opening is very distant from the urinary passages. When the fistula is narrow and tortuous, injections will not always pass into the bladder or urethra, but become extravasated in the cellular substance. It is often difficult, sometimes even impossible, to find out the internal orifice of the fistula with a probe. When it communicates with the rectum, or vagina, the opening may sometimes be perceived with the finger, and occasionally, a staff introduced through the urethra, may also be felt in those parts. When the fistula originates in the bladder, the issue of the urine is continual; and when it arises in the urethra, the discharge of this fluid is only made, when the patient has occasion to make water. This distinguishing sign is not constant, and, in Desault's works, mention is made of several cases, in which the urine did not issue from fistulæ communicating with the bladder, except when the patients endeavoured to empty that organ.

Fistulæ of the kidneys, or ureters, are entirely beyond the reach of art, unless they should be kept up by the retention of urine in the bladder, or the presence of a foreign body in the track of the fistula. The re-establishment of the natural course of the urine, and the extraction of the extraneous substance may, in such a case, effectually contribute to the cure. Here, however, we have no certain means of preventing the urine from entering the fistula. This is not the case, with respect to fistulæ of the urethra, where we are, as it were, masters of that fluid. It is particularly in these latter disorders, that elastic gum catheters are attended with inestimable advantages.

When fistulæ of the bladder, or urethra, are the consequences of a retention of urine, produced by obstructions in this last canal, these obstructions often exist still; sometimes they have even increased since the formation of the fistula, which circumstance, in the majority of cases, renders the introduction of the catheter extremely difficult.

It is particularly when fistulæ terminate in the lower part of the bladder, that the utmost care must be taken to prevent the catheter from being stopped up by any foreign body, which would obstruct the urine, as well as to hinder the instrument from becoming displaced, or slipping out of the bladder. Perhaps, in this instance, instead of stopping up the catheter, it would be better to keep it constantly open, in order to prevent all accumulation of urine in the bladder, and the passage of this fluid through the fistula. But, when the fistula communicates with the urethra, no advantage would be derived from keeping the catheter open, and the treatment would be more painful and unpleasant to the patient.

In both cases, Desault recommends us to continue the employment of the catheter, not only until the fistula is cured, but also until the obstacles, which hinder the urine from passing the natural way, are removed. If, besides, there should exist any of the complications, spoken of in treating of blind external fistulæ, the methods there advised are to be pursued; but, in general, the catheter will suffice to effect the cure. Certain fistulæ, however, demand a particular mode of treatment. Such are those, which form communications between the bladder and the rectum, or vagina.

Fistulæ of the bladder, communicating with the vagina, and produced by difficult labours, are almost always attended with loss of substance. The forcible contusion occasioned by the child's head on the anterior parietes of the vagina and bottom of the bladder, gives rise to the formation of sloughs, the separation of which sometimes leaves apertures large enough to admit the finger, and hence the cure is exceedingly difficult. In treating such fistulæ, there are two indications to be fulfilled; 1st to keep the urine from passing into the vagina: 2dly. to keep the edges of the division as closely as possible together, so as to give them an opportunity of uniting.

The first of these indications demonstrates more and more the utility, and even the necessity of the catheter. In women, its introduction is easy; but in them it is more difficult to fix the instrument, than in men. Desault contends, however, that it is very essential to have it favourably fixed in the bladder, so that the urine may escape, immediately it arrives in this viscus. None of the means hitherto employed, seemed to Desault to answer this purpose completely. This eminent surgeon found, that the only effectual plan was to fasten the catheter to a point, that always retained the same position, with respect to the meatus urinarius. He used a kind of machine made after the manner of a truss, the circle of which was long enough to embrace the upper part of the pelvis, and had in its middle an oval plate to be placed upon the pubes. In the centre of this plate was a groove, to which a piece of silver was fitted, curved so that one of its ends having an aperture in it, came over the vulva, on a level with the meatus urinarius. This piece of silver admitted of being fastened to the plate with a screw. After having introduced, and arranged the catheter in the bladder, so that its beak and eyes may be situated at the lowest part of this viscus, the end of the instrument is to be put through the aperture of the piece of silver, which slides in the groove of the plate, and it is afterwards to be fixed in the way already explained. By means of this machine, the catheter is invariably fixed, without incommoding the patient even when she is walking.

In this disease, large catheters with full sized apertures should be employed, so that the urine may more readily escape through the instrument, than fall into the vagina. In the early part of the treatment, the catheters should also be left constantly open.

In order to fulfil the second indication, and keep the edges of the division as near together as possible, Desault advises us to introduce into the vagina, a soft kind of pessary, large enough to fill the vagina, without distending it. The introduction of this instrument changes the form of the fistula from round to oval, which is the most favourable to its reunion; and it has also the advantage of closing the fistula, and hindering the urine from falling into the vagina. These fistulæ often cannot be cured till after much time,—six months, and even a year.

When the rectum is wounded in the operation of lithotomy, an event that may be known both by the escape of the feces through the wound, and the introduction of the finger into the incision, or within the rectum, Desault advises us to divide at once the parts comprehended between the wound of the operation, the opening in the rectum, and the margin of the anus. This, he says, is the means of preventing the feces from passing into the bladder, and the urine into the rectum. This second operation allows the matter to escape readily, and cicatrization taking place from the bottom of the wound, in the direction outward, the patient is cured without any fistula; whereas this last grievance is almost inevitable, when the preceding plan is not adopted early. It deserves attention, that the catheter is then incapable of effecting a cure. It effectually prevents the urine from entering the fistulæ; but, it cannot hinder the feces from doing so, which would keep up the disease.

For Desault's particular method of dividing the parts, I must refer to his works. (See *Œuvres Chirurgicales de Desault par Bichat, Tom.* 3, *p.* 287—300.)

**URINE, INCONTINENCE OF.** This complaint is quite the reverse of a retention of urine; for, as in the latter affection, the urine is continually flowing into the bladder, without the patient having the power to expel this fluid; so, in the former, the urine flows out, without the patient being able to prevent the occurrence.

An incontinence of urine may originate from several causes. 1. From the irritation of the neck of the bladder by stones. 2. From a paralysis of the sphincter vesicæ, while the contractile power of the muscular coat of the bladder remains in its natural state. 3. From laceration of the parts in the extraction of large stones, and a consequent paralysis of the sphincter after the wound has healed. 4. From the injury, which the parts suffer from pressure in difficult labours.

When an incontinence of urine proceeds from an irritation of the neck of the bladder by a stone, it can only be radically cured by the operation of lithotomy; though great relief may be given by mucilaginous and anodyne medicines, particularly, when given in the form of injections. In the other two cases, in which it is occasioned by a paralytic affection of the sphincter, we can only attempt the cure by such medicines as are proper in other paralytic cases, viz. the Peruvian bark, chalybeates, the cold bath, and other tonics; but, of all topical remedies, cold applications to the perinæum are found to be the most effectual. The most powerful remedy of this kind is to dash cold water upon the part; though it is sometimes found useful to apply cloths dipped in vinegar and water, or a solution of saccharum saturni, in the acetous acid.

When no relief can be obtained by the above proposed remedies, we must then have recourse to some mechanical method of compressing the urethra, and thus preventing the continual dribbling of the urine, which must always be very disagreeable. A very proper instrument for this purpose is called a *jugum*, or yoke. It ought to be lined with silk or velvet; and, by means of the screw, the pressure may be made greater or lesser at pleasure. For women, we must make use of pessaries. These must be made of sponge, only of such a size as to be easily admitted, and, before they are introduced, they must be moistened with the finest olive oil, which, according to Mr. Latta, most effectually prevents them from becoming soon troublesome by excoriating the vagina. Pessaries, made of wood, can never be used in cases of this kind with effect; for, in placing them in the vagina, so as to compress the neck of the bladder, it is obvious they must at the same time press upon the rectum, and, on that account, prevent the natural passage of the feces. In some particular cases, even these palliative remedies prove ineffectual; for, when the disorder proceeds from an irritation of the neck of the bladder, the patient has such a continual desire to make water, that it is impossible to bear any confinement of it. We can then merely employ proper receptacles for collecting it as it flows. In women these can only be by pieces of sponge, applied externally, and kept in that situation with a T bandage; but in men, other contrivances may be employed.

In the Medical Observations, we have some surprising instances of the efficacy of blisters in removing this complaint. A girl, thirteen years of age, who, for four years, had been able to retain her water only a very short time in the day-time, and not at all during the night, was cured in twenty-four hours by the application of a blister to the os sacrum. A man, thirty-two years of age, was attacked by this disease, accompanied with a palsy of the lower extremities, in consequence of having taken some virulent quack medicines, probably of the mercurial, or arsenical kind. In twenty-four hours after the application of a blister to the os sacrum, he was able to retain his water for an hour, and in a week afterwards, for two hours. In about a month, he was able to retain it for five hours, and at last obtained a perfect cure. He also recovered in some degree the use of his limbs, which were paralytic. The like good effects were produced on a woman of fifty, in whom the disease had been brought on by a strain. In her it was likewise accompanied with a palsy of the lower extremities, and of this too she got the better. In a woman of forty-three, in whom the disease seems to have come on without any evident cause, the cure was accomplished, almost during the time that the blister was rising. In a young man, who had been attacked with the disease, after lifting a heavy load, a cure was accomplished in sixteen days. A man of forty-four years of age, who had been attacked by the disease, without any evident cause, was in like manner cured on the first application of a blister. This man had likewise symptoms of diabetes; but the blister had no effect in removing them. A boy, ten years of age, had violent complaints in the urinary passage, which were supposed to proceed from an ulcer. "When about to make water, he was obliged to put himself in a prone posture, and then his urine generally came away by drops, with exquisite torture. At length, it began to come away insensibly during the night;" but, by the application of a blister, this incontinence was removed in less than forty-eight hours, the other symptoms remaining as they were. In all these cases, the blisters were very large, covering not only the os-sacrum, but extending from side to side.

**URINE, RETENTION OF.** It is observed by the experienced Mr. Hey, that a retention of urine in the bladder, when the natural efforts are incapable of affording relief, is, in male subjects, a disease of great urgency and danger. Persons, advanced in years, are more subject to this complaint, than those, who are young, or middle-aged. It is often brought on by an incautious resistance to the calls of nature; and, if not speedily relieved, generally excites some degree of fever.

It is sometimes attended with a considerable degree of fever, and an inflammatory affection of the bladder, which terminates in a discharge of purulent matter, and a fatal hectic.

The distinction, says Mr. Hey, which has sometimes been made, between a *suppression* and *retention* of urine, is practical and judicious. The former most properly points out a defect in the secretion of the kidneys; the latter, an inability of expelling the urine when secreted.

The *retention of urine* is, an inability, whether total or partial, of expelling, by the natural efforts, the urine contained in the bladder. The characteristic symptom of this disease, previous to the introduction of the catheter, is a distention of the bladder (to be perceived by an examination of the hypogastrium), after the patient has discharged all the urine, which he is capable of expelling.

As this complaint may subsist, when the flow of urine from the bladder is by no means totally suppressed, great caution is required to avoid mistakes on this subject.

Violent efforts to make water are often excited at intervals, and, during these strainings, small quantities of urine are expelled. Under these circumstances, the disorder may be mistaken for the strangury.

At other times a morbid retention of urine subsists, when the patient can make water with a stream, and discharge a quantity equal to that, which is commonly discharged by a person in health. Under this circumstance, Mr. Hey has known the pain in the hypogastrium, and distention of the bladder, continue, till the patient was relieved by the catheter.

And lastly, it sometimes happens, that when the bladder has suffered its utmost distention, the urine runs off by the urethra, as fast as it is brought into the bladder by the ureters. Mr. Hey has repeatedly known this circumstance cause a serious misapprehension of the true nature of the disease.

In every case of retention of urine, which this gentleman has seen, the disease might be ascertained by an examination of the hypogastrium, taken in connection with the other symptoms. The distended bladder forms there a hard and circumscribed tumour, giving pain to the patient when pressed with the hand. Some obscurity may arise upon the examination of a very corpulent person; but, in all doubtful cases, the catheter should be introduced.

Mr. Hey mentions, that he has seen but a few cases of the *ischuria renalis*, or complete suppression of the secretion of urine by the kidneys. The disease proved fatal in all his patients except one, in whom it was brought on by the effect of lead, taken into the body by working in a pottery. It subsisted three days, during a violent attack of the colica pictonum, and was then removed, together with the original disease. Mr. Hey found no difficulty in distinguishing this disorder, in any of the cases, from the *ischuria vesicalis*, though, for the satisfaction of some of his patients, he introduced the catheter. (*Practical Observations in Surgery, p.* 374, *&c.*)

Ischuria, or retention of urine, may be the effect of a great many different causes. We shall proceed to take notice of the causes, which are produced by a paralysis of the bladder; by inflammation of its neck; by foreign bodies in it; by pressure made on it by the gravid uterus; by an enlargement of the prostate gland; and by strictures in the urethra.

### 1. OF THE RETENTION OF URINE CAUSED BY A PARALYSIS OF THE BLADDER.

This complaint, to which persons advanced in life are particularly subject, may occur in subjects of any age, in consequence of a violent concussion of the spinal marrow, or (what is very common) if, after having taken a large quantity of drink at a time, a person should neglect to obey the calls of nature, and hold his urine too long. It is also observed to be a symptom of certain typhoid fevers, and consequently, too great attention cannot be paid to the state of the bladder in such disorders. The retention of urine is easily ascertained to exist by the prominence, which it forms above the pubes; a prominence, which may be readily distinguished by its elasticity and circumscription from the general tension of the abdomen, so common in this disease. A retention of urine may either come on in a gradual or sudden manner. In the first sort of case, it begins by a kind of debility, which hinders the patient from completely emptying his bladder, so that, after having made water, he still feels an inclination to repeat the evacuation, and is compelled to make frequent efforts to do so. This inconvenience gradually increases; at length, none of the urine can be discharged; and the bladder rises higher than the pubes, above which part it forms a round circumscribed tumour, the size and elasticity of which are more or less considerable.

In the second kind of case, or that which occurs suddenly, the retention of the urine is the first symptom, which the patient experiences, and his bladder becomes filled, and distended, in the same manner, as in the preceding case. Most frequently, the swelling, which this viscus forms, is at first not particularly painful, but afterwards becomes very much so. Some patients make frequent efforts to expel their urine; others are more tranquil. This state lasts two or three days, after which the urine begins again to escape from the urethra, sometimes by drops, sometimes in a stream, but, almost always, at the will of the patient. In some instances, as much urine is voided, as the fluid, which is drunk; yet, notwithstanding this, the bladder continues to be distended with urine, and to form an elevation, above the pubes. This circumstance has frequently led practitioners into error, and some of them have even mistaken the swelling of the hypogastric region for an abscess. Collot mentions, that, in his time, this mistake happened very frequently, and that such supposed abscesses would have been often opened, had not the patients warned their medical attendants of the erroneous opinion. M. Sabatier informs us, that he was consulted about a woman, who had been advised to resort to the mineral waters, with a view of dispersing a tumour, which had occurred in consequence of a difficult labour, and which swelling was supposed to be situated in the uterus. The tumour, however, was nothing else, than the bladder, distended with an accumulation of urine, since it disappeared as soon as a catheter was introduced. No suspicion had been entertained of the real nature of the case, in consequence of the patient having voided her urine in a voluntary manner, and reasonable quantity, for five, or six weeks, during which time the swelling had existed.

M. Sabatier makes mention of a case, inserted in a thesis by Dr. Murray, from which it appears, that the swelling of the bladder may become so considerable as to lead to mistakes of a still more serious nature. A delicate woman found her abdomen swell, without any apparent cause, and without experiencing any inconveniences. She imagined that she was pregnant. However, she was soon undeceived by the rapidity, with which her abdomen continued to enlarge, and by the considerable degree of anasarca affecting her lower extremities. The latter affection extended also to the arms, and face. The patient was considered to be dropsical; and a surgeon was sent for to tap her. The fluctuation of a fluid in the abdomen was quite evident. Some diuretics were prescribed, before having recourse to the operation. While such remedies were put to a trial, the patient complained of having had a total retention of urine for three days; a symptom, which she had not previously suffered. The belly was elastic, and the veins on it were every where swollen. It was judged prudent to introduce a catheter, before employing the trocar. The surprise was very great when eighteen pints of urine were drawn off, and the swelling of the abdomen subsided. The next day, the catheter drew off twelve more pints of urine. The anasarca, which was entirely symptomatic, disappeared. The application of cold water re-established the tone of the bladder, so that, when three pints of urine had been drawn off by means of the catheter, the patient herself could spontaneously expel three or four others, with the aid of some degree of pressure on the hypogastric region. Dr. Murray endeavoured to ascertain, whether the woman got completely well; but, he could not trace this circumstance.

The retention of urine, produced by a paralysis of the bladder, and the swelling, which this viscus occasions above the pubes, may continue for a long while, without patients feeling any other inconvenience, than a sense of weight about the region of the pubes, and the frequent inclinations to make water, which accompany this state. M. Sabatier mentions his having seen patients, who had been attacked by the complaint for more than six months.

The disorder may be relieved by introducing a catheter into the bladder, by which means the urine has an opportunity of escaping. For an account of the manner of introducing this instrument, see *Catheter*.

It is not enough to empty the bladder, care must be taken to prevent the urine from accumulating again, and, consequently, the catheter, according to some, must be left introduced. Others are of opinion, that it is better to pass the instrument whenever the patient has any occasion to make water. According to Desault and Mr. Hey, the bladder regains its contractile power soonest, when the catheter is introduced as often as occasion requires, instead of being allowed to remain continually in the urethra.

When the retention of urine has lasted a considerable time, when the hypogastric region is painful, and the patient is feverish, venesection may be performed, and, in all cases, diluent beverages, of a slightly astringent nature, are to be prescribed. The intestines are to be emptied with glysters, and the regimen is to be regulated by the condition, in which the patient happens to be.

For a certain length of time, things remain in this state. When the urine flows from the catheter in a rapid stream, which is projected to some distance, and when it also passes out between the catheter and the urethra, it is a sign, that the bladder has regained its power of contraction, and that it can empty itself, without the aid of the instrument. In this circumstance the catheter is to be taken away, and the patient may gradually resume his occupations, and usual mode of life. When the urine only escapes through the catheter, and in a slow stream, the employment of this instrument is always requisite, and its use cannot be discontinued, without hazard of the bladder becoming distended again, and losing whatever degree of tone it may have recovered. However, a catheter cannot be suffered to remain in the bladder more than twelve days, or a fortnight. Some persons have in their urine so much mucus and earthy matter, that an incrustation would not fail to take place on the instrument, if care were not taken, every now and then, to withdraw it and clean it. In other persons, the pressure, which the catheter makes on the part of the urethra, corresponding to the root of the penis, in front of the scrotum, occasions in this situation an inflammation, which ends in mortification, so that a slough about as large as a crown takes place, followed by an opening with loss of substance, which opening remains fistulous during the remainder of the patient's life. The latter inconveniences do not attend the employment of flexible gum catheters.

The time which the bladder takes to regain the power of contracting, varies considerably in different cases. When the disease is accidental and sudden, it frequently goes off in a few days. When it has come on in a slow manner, it usually lasts about six weeks. The cure, however, is not to be despaired of, if the paralytic affection of the bladder should continue much longer. M. Sabatier says, that he has seen patients wear a catheter upwards of ninety days, and yet ultimately get completely well. When there is reason for believing, that the urine will come away of itself, the use of the catheter may be discontinued, great attention being paid to the state of the patient. When he makes water very slowly; when he is obliged to make frequent attempts; and when he feels a sense of weight about the neck of the bladder; this viscus has not recovered the whole of its tone, and the employment of the catheter is still necessary. Sabatier states, that he has often successfully recommended the catheter to be worn only in the night-time, when the patient could make water tolerably well in the day, and experienced the above complaints in the night.

When three or four months elapse, without the urine resuming its ordinary course, Sabatier informs us, that, we may be sure, that the tone of the bladder is lost for ever. In this unfortunate case, all that can be done is to advise the patient to make continual use of a flexible catheter, which he should be taught to introduce himself, whenever he has occasion. (See *De la Medécine Operatoire par Sabatier, Tom.* 2.)

Among the means deserving of trial, when the contractile power of the bladder does not return with the use of the catheter, I have to mention the tincture of cantharides; blisters applied to the sacrum, and kept open with the savine ointment; and cold washes to the hypogastric region.

### 2. OF THE RETENTION OF URINE, OCCASIONED BY INFLAMMATION OF THE NECK OF THE BLADDER.

This case makes its attack with the most urgent symptoms. Besides the inclination to make water, and the efforts, which such inclination causes, the patient is affected with a swelling of the bladder above the pubes, a deep-seated pain in that viscus and all the neighbouring parts. Fever, nausea, vomiting, a urinary smell in the breath, and perspiration, great restlessness, a difficulty of breathing, convulsions, and death, are the train of evils, which may ensue.

The present kind of retention of urine demands the employment of the antiphlogistic plan of treatment; particularly, of bleeding, the tinctura ferri muriati, purgative medicines, diluent emollient beverages, opiate glysters, the warm bath and anodynes. This is a sort of case, in which Mr. Henry Earle's proposal of trying the effects of a tobacco clyster might be adopted. Indeed, this is a means, which may be rationally practised in every example, in which a retention of urine obstinately resists ordinary plans of treatment, and is attended with a spasmodic affection of the urethra and neck of the bladder. The three cases, which Mr. Earle has recorded, clearly prove, that tobacco is a remedy, possessing considerable power in such forms of the complaint. (See *Medico-Chir. Trans. Vol.* 6, *p.* 82, *&c.*) At the same time, I do not know, that it is more effectual, than opium administered in clysters, which is given in the same description of cases, and, as every body knows, frequently with complete success. The introduction of instruments into the urethra in every instance, attended with inflammation and spasm in that passage, or about the neck of the bladder, ought certainly to be avoided as long as possible, and the trial of antiphlogistic and anodyne remedies made. But, when these are unavailing, the catheter should be resorted to, and its use should never be deferred so long, as to afford any chance of the distention of the bladder occasioning a paralysis of this viscus. In these cases, it is generally better to use an elastic gum catheter, which is much less irritating to the urethra than a metallic instrument. When the catheter cannot be introduced, and further delay would be attended with a risk of the bladder sloughing, and the urine becoming extravasated, the operation of puncturing the bladder is immediately indicated. (See *Bladder.*)

### 3. OF THE RETENTION OF URINE, OCCASIONED BY FOREIGN BODIES IN THE BLADDER.

Several kinds of extraneous matter may be lodged in the bladder: for instance, stones, worms, pus, blood, &c. Here, we shall only treat of the retention of urine, originating from the presence of stones, or of blood, because these causes are the most frequent.

One, or more stones in the bladder give rise to particular symptoms explained in the articles, *Urinary Calculi* and *Lithotomy.* They seldom occasion a total retention of urine. If such a case were to present itself, it might be easily understood by preceding circumstances. The complaint might be relieved, and this, perhaps, for a considerable time, by introducing a sound, which would push the stone away from the neck of the bladder, towards the fundus of this viscus. Instances are not uncommon, in which the patients, after having been tormented by the lodgment of stones in the bladder, became afterwards quite free from all kind of uneasiness. Sabatier makes mention of a clergyman, who was sounded by a very skilful surgeon, and who finding himself afterwards free from the pains, which he before suffered, thought, that the surgeon had been mistaken, when he said, that there was a stone in the bladder, and that lithotomy ought to be performed. The patient also bequeathed his body for dissection to the surgical practitioner, in order that the latter might reap instruction from the examination. The surgeon accepted this odd legacy; and, when the body was opened in the presence of numerous spectators, a large stone was found in the bladder.

Blood may descend from the kidneys into the bladder: or it may accumulate in this latter receptacle, in consequence of some injury, or ulceration of its inner coat. When the blood remains in a fluid state, it may be voided almost as easily as the urine itself. But, when it coagulates, the clots, which are formed, may obstruct the neck of the bladder, and occasion a retention of urine; a case which is the more alarming, as the collection of blood generally cannot be drawn off by means of a catheter. However, one of a very large size should be introduced, in order to try whether the thing is practicable. When this method fails, authors advise a syringe to be fastened on and adapted to the outer end of the catheter, by which means the blood and urine are to be sucked, as it were, out of the bladder. Sabatier states, that this plan has been practised with success, in cases, which seemed almost desperate.

### 4. OF THE RETENTION OF URINE, CAUSED BY THE PRESSURE OF THE GRAVID UTERUS ON THE BLADDER.

Such pressure often occasions a difficulty of making water, and a retention of urine. Women relieve themselves by leaning down on their knees and elbows, in which position, the uterus makes less pressure on the neck of the bladder. Some introduce one, or two fingers into the vagina, and push the uterus upward. Others must have the catheter introduced, particularly, about the period of parturition. When there are no other impediments to the passage of the catheter, than the cause of the disease, the instrument may easily be introduced.

When, however, the course of the meatus urinarius is rendered crooked, either in consequence of an old prolapsus uteri, or of the pressure occasioned during labour, the urine can only be drawn off by means of a catheter, with a rounded end, which instrument should be first introduced with its handle as much towards the belly as possible, after which, this part of the instrument is to be brought downward by a semi-circular motion. *(Sabatier Médecine Opératoire, Tom. 2, p. B. 7.)*

### 5. OF THE RETENTION OF URINE CAUSED BY THE ENLARGEMENT OF THE PROSTATE GLAND.

When the swelling of the prostate gland is of an inflammatory kind, the retention of urine makes its appearance by symptoms, which always attend an inflammation of the neck of the bladder. This affection sometimes ends in an abscess, which bursts of itself. Some writers have contemplated the propriety of making an incision into the suppurated gland; but, such a proceeding, perhaps, can never be at all justifiable, or prudent.

Here, exactly the same kind of treatment is proper, which has been recommended for the retention of urine arising from inflammation about the neck of the bladder. In particular, bleeding, the warm bath, opening medicines, anodyne clysters, the tinctura ferri muriati, and, in very obstinate urgent cases, an enema of tobacco, should be tried. If these means fail, the surgeon may gently endeavour to introduce an elastic gum catheter.

The diseased enlargement of the prostate gland has been treated of in another part of this Dictionary. See *Prostate Gland.* The retention of urine, occasioned by this disease, begins with a difficulty of making water, just such a kind of difficulty, as occurs when the bladder has been deprived of some of its contractile power, and it admits of relief from the use of slightly diuretic beverages. When the complaint becomes more urgent, and the urine cannot be any longer evacuated, the introduction of a catheter becomes indispensable. Although this operation is, in every respect, perfectly easy of accomplishment, it is not always attended with the desired success. The catheter passes in as far as it can; but, the urine is not discharged, because the end of the instrument, according to Sabatier, becomes entangled in the prostate gland, or between a swollen portion of this gland and the neck of the bladder, and does not reach to the situation of the urine. Hence, Sabatier recommends the employment of a catheter with a very long beak. From the account, however, which we have delivered of the alteration produced in the course of the urethra by the morbid enlargement of the prostate gland, (see *Prostate Gland*,) it appears, that the canal in question generally makes, in this case, a sudden turn upwards, just before it approaches the bladder, consequently when a catheter has its end bent a little more upwards, than usual, it is best adapted for passing into the bladder, in the affection under consideration. When the surgeon has succeeded in introducing a catheter, it is to remain introduced, till the bladder has recovered its tone, or contractile power, just as was recommended in the case of paralysis of this viscus. When, however, all efforts to pass a catheter are quite ineffectual, the only remaining resource is to puncture the bladder above the pubes. (See *Bladder, Puncture of.*) In this case, the operation should never be done through the perinæum, or rectum, as the very great size, which the diseased prostate gland sometimes attains, would be an obstacle to making a puncture in either of these situations. Puncturing the bladder, however, is only a temporary means of relief, unless this organ recovers its contractile power, or the surgeon succeeds in introducing a catheter through the urethra. When neither of these circumstances occurs, the cannula of the trocar must not be withdrawn.

The objections, which immediately present themselves to leaving in the cannula, for any considerable time, are: the irritation of the extraneous body; the fear of calculous incrustations forming both on the outside and inside of the cannula; and the hazard of not being able to find out again the track into the bladder, when the instrument is ever withdrawn. However, Sabatier confirms, that the cannula may sometimes be successfully allowed to remain in the bladder. Collot adduces two instances, in which he found this method very serviceable. Sabatier also refers to another example of similar success, related in a thesis by Murray. An incision had been made above the pubes, in order to be more easily able to introduce the trocar into the bladder. The wound inflamed, suppurated, and was in a healing state; but, as the urine could not be voided through the urethra, the cannula was left in the puncture. Things had gone on in this manner, more than a year, when Dr. Murray saw the patient. The man was sixty years of age, and enjoyed very good health. He was in the habit of taking a stopper out of the cannula, every four hours. The wound had healed very well all round the tube, and was quite free from redness.—(*Sabatier, Médecine Opératoire, Tom.* 2. *p.* 140.)

### 6. OF THE RETENTION OF URINE PRODUCED BY STRICTURES IN THE URETHRA.

From the account, which is given of strictures in another part of this Dictionary, (see *Urethra, Strictures of,*) it appears, that almost every stricture, how bad soever it may be, is capable of being rendered still worse, and the morbid part of the urethra, more impervious by a spasmodic affection. Going out of a warm into a cold situation, drinking, and other kinds of intemperance, will often bring on an irritable state of the canal, attended with a spasmodic action of the strictured part, an increased difficulty of voiding the urine, and even a total retention of this fluid. The patient makes repeated efforts to relieve himself; but hardly a drop of urine is discharged. In the mean while, the bladder becomes filled, and ascends above the pubes; the abdomen grows tense and painful; fever comes on; the countenance looks red; the brain becomes affected; and circumstances assume an extremely urgent appearance.

In this case, antiphlogistic means should be adopted, without delay. The patient ought to be bled, if nothing in his constitution and age prohibit this evacuation, which it may even be proper to repeat. He should also be put into the warm bath, and fomentations should be continually applied to the hypogastric region. Slightly diuretic beverages may be prescribed; and leeches put on the perinæum. The principal means, however, from which the greatest benefit may be expected, is a liberal dose of the tinctura opii, together with an anodyne glyster. This is also another example, for which Mr. Earle has particularly recommended the exhibition of tobacco in the form of a clyster, and he has related a case in illustration of the efficacy of the plan. (See *Medico-Chir. Trans. Vol.* 6, *p.* 88.) The tinctura ferri muriati, which according to Mr. Cline, has a specific effect in overcoming spasm of the urethra, seems also worthy of trial. Indeed, it should always be tried before tobacco, which being sometimes violent in its effects, ought perhaps to be the last resource in the way of medicines. When such measures fail in enabling the patient to empty his bladder, and this viscus is becoming more and more distended, an immediate attempt should be made to introduce a small flexible elastic gum-catheter, through the stricture or strictures into the bladder, which object may be frequently accomplished, when due care, perseverance, and gentleness, are not neglected.

Sometimes when a small flexible catheter cannot be introduced, a fine bougie admits of being passed into the bladder, and, on being withdrawn, the urine follows, and is discharged.

When all the preceding plans prove unavailing, and the danger arising from the retention of urine continues to increase, the only remaining resource is to puncture the bladder. The cannula of the trocar should then be left in the wound, till the strictures are either cured, or at least till the urine seems to resume its natural course through the urethra.

Useful information on the subject of retention of urine may be found in *De la Médecine Opératoire, par Sabatier, tom.* 2. *Hey's Practical Observations in Surgery. Desault's Parisian Chirurgical Journal. Sœmmering, Abhandlung über die Schnell und langsam tödtlichen Krankheiten der Harnblase und Harnröhres bey Männern im hohen Alter.* 4to. *Frank. p.* 1809. *Richter's Anfangsgrunde der Wundarzneykunst, B.* 6, *p.* 210, *&c. Œuvres Chir. de Desault par Bichat, Tom.* 3. *Home's Practical Observations on the Treatment of Strictures, &c. vol.* 2. 1803. *Mr. Earle's* observations on the efficacy of tobacco are contained in the *Medico Chirurgical Trans. Vol.* 6, *p.* 82, *&c.*

**UTERUS, INVERSION OF.** This case may either be complete, or incomplete. When it is incomplete, only the fundus of the uterus passes through the os tincæ. When the inversion is complete, the uterus becomes entirely turned inside out, passing through the opening in its cervix, dragging along with it a part of the vagina, and descending more or less far down, sometimes even between the patient's thighs.

The inversion of the uterus mostly arises from the manner in which the placenta is extracted after delivery. Just after parturition, the parietes of the uterus have not had time to become contracted, and the mouth of this viscus is as capacious as it can possibly be. It is easy of comprehension, how it may happen, that, when things are thus disposed, the uterus may follow the after-birth, which is attached to the parietes of this organ, and thus become inverted. The event is particularly liable to happen; 1st, When a premature attempt is made to extract the placenta. 2dly, When the funis is pulled outward, without any care being taken to support the uterus by the fingers of the left hand. 3dly, When the operator draws the after-birth outward in too rough and forcible a manner. It is true, that the placenta is sometimes so adherent, that its extraction is very difficult, and some risk must be encountered of dragging down the uterus with it. However, this unpleasant occurrence may generally be avoided by taking care to separate the placenta, by introducing one's fingers into the cavity of the uterus.

The inversion of the uterus, following parturition, should not always be ascribed to unskilfulness on the part of the practitioner. The accident frequently happens, notwithstanding every precaution to prevent it, either because the patients make too violent efforts to deliver themselves; or because the uterus is enlarged and heavy; or else in consequence of some natural disposition in the uterus, which disposition can neither be foreseen nor prevented. Ruysch has seen an inversion of the uterus take place, after the expulsion of the placenta, although the delivery had occurred in the most favourable way. This disposition is very common in persons, who have once been afflicted with an inversion of the uterus. Amand makes mention of a woman, who had had an inversion of the uterus in her first delivery, and had been freed from the affliction by this practitioner. The same patient was attended by Amand again in her next accouchement, and another inversion of the uterus, quite as bad as the first, would certainly have happened, had not Amand, on perceiving the disposition to the accident, introduced his finger into the cavity of the uterus, and separated the placenta from its attachments, before making any attempt to extract it.

Besides the causes of the inverted uterus, which are connected with parturition, there are some others, which have no concern with it whatsoever. Ruysch, Mauriceau, and Lamotte, were of opinion, that the inversion of the uterus could only happen at the time, when the placenta was extracted, or a little while afterwards. The occurrence seemed to them quite impossible at any other period, both because the substance of the uterus is very thick and solid, and its mouth is very contracted. However, Sabatier remarks, that there are many facts, which prove that this disease may depend on internal causes, and that it may affect women, who have had no children, as well as others, who have had them. Polypi of the uterus are causes of this kind. As their pedicle is attached to the fundus of the uterus, and is very firmly inserted into it, they may easily drag it downward, when its texture is lax and soft, particularly, as their action, arising from their weight, is continual and uniform. We may also reckon among the causes, the hemorrhages, to which women are subject, both because they relax the texture of the uterus, and because they are usually attended with an acute pain, which makes the diaphragm and abdominal muscles contract, and act upon the uterus with all their power.

When an inversion of the uterus takes place after delivery, there are certain symptoms by which it may easily be known. The uterus, when in its natural situation, presents itself in the hypogastric region in the form of a round circumscribed tumour; but, when it has fallen downward, and become inverted, the above tumour cannot be found, and, a vacancy may be felt in the situation, which it ought to occupy. When the inversion is incomplete, an examination with the fingers detects in the vagina a tumour, shaped like the segment of a sphere, having a smooth surface, and being surrounded with the cervix uteri, as with a kind of collar, round which the finger may easily be passed, either between the kind of collar and the uterus, or between the collar and the vagina. When the inversion of the uterus is complete, there is in the vagina, and sometimes quite protruded, a tumour, apt to bleed, of an irregularly round shape, with a smooth surface, and hanging by a neck, which is surrounded by the above circular, thick, fleshy, substance, consisting of the os uteri itself. In the incomplete inversion, patients feel acute pain in the groins, and kidneys, an oppressive sense of heaviness in the hypogastric region, and a tenesmus, which, compelling them to make violent efforts, forces the uterus down more and more, and produces a total inversion of it. To such symptoms are often added hemorrhages, which are more or less copious. But, when the inversion is complete, the pain is more acute, the loss of blood more considerable, and the patient is often affected with peculiar weakness, which is frequently followed by cold sweats, convulsions, and delirium.

The reduction of the uterus is the only method, by which the above described sufferings can be appeased, and it ought to be put in practice the more quickly, in proportion to the urgency of the symptoms. When these are pressing, the least delay may be followed by the worst consequences. Some women, indeed, perish in a few hours, and, when they live longer, the reduction becomes exceedingly difficult, because the uterus and its cervix are continually becoming more and more contracted.

Sabatier censures the advice to put some linen between the hands and the uterus, in making the reduction, as an unnecessary measure, and one, which bereaves the operator of the information to be derived from the organ of touch, relative to the progress of the operation. The manner of proceeding can hardly be determined by any precepts. It must be regulated by existing circumstances; and the trial should not be abandoned as long as the patient's strength will allow a perseverance. Perhaps, however, if the tumour should be in an inflamed state, it might be prudent, before attempting to reduce it, to take away blood, put the patient in the warm bath, use emollient applications, exhibit anodyne medicines, &c.

When the inversion of the uterus is complete, and the reduction has not been accomplished in due time, an endeavour must be made to quiet the spasms and pain arising from the accident, and the surgeon must await what nature will do for the patient. Many die; while others survive, subject to an oppressive sense of weight, and frequent hemorrhages, which bring on great emaciation. Sabatier informs us of his having seen two patients, who had had an inversion of the uterus, during six months, and who were still able to go about their family affairs. The same author says, he has heard of some other persons, who have had an inversion of the uterus several years.

One of the most afflicting consequences, which may result from an inversion of the uterus, is so considerable an inflammation of the part, as to induce a danger of its mortifying. In this circumstance, some have proposed to extirpate the uterus; an operation, however, that has not been attended with any degree of success, as the majority of patients on whom it has been practised have died. However, there are instances recorded of women having recovered after such an operation. Vieussens has related a case of this kind, in which a ligature was applied round the neck of the swelling, and the part below amputated.

The practice of extirpating the inverted uterus, through apprehension of the part mortifying, however, cannot be reprobated in terms too strong. The only alleged reason for having recourse to the operation, is the very considerable degree of inflammatory swelling, which affects the part. But, it is not altogether impracticable to bring the uterus into a state again, in which the inconveniences, arising from its inversion, would be very supportable, so that an operation might be avoided, which is always attended with extreme danger. Even supposing mortification were to take place, the indication would be to appease the bad symptoms, and promote the separation of the sloughs by suitable applications. Rousset has recorded an example, in which the latter mode of practice was adopted with success.

Some writers have not been content with advising the extirpation of the uterus, when it is entirely inverted, very painful, and irreducible, in consequence of the contracted state of the cervix of this organ; but, they have also thought such a proceeding proper in cases of a complete prolapsus, when the part is much swollen and inflamed. Instances have been adduced, illustrative of the success of this operation. However, it is now generally thought, that most of these examples are invalid, as polypi, growing from the uterus, frequently attain so considerable a size, that they protrude out of the vagina, so as to have occasionally been mistaken for the uterus itself. These have been extirpated with a ligature, with most beneficial consequences to the patient.

There is no doubt, however, that, in a few instances, the uterus has been amputated, and the patient has recovered.

Although it is easy to distinguish the inversion of the uterus, which happens soon after delivery, it is not so to make out the nature of such cases, as happen in other circumstances, notwithstanding the presence of the same kind of symptoms. As cases of the latter kind are exceedingly uncommon, and, consequently, they are not at all expected, mistakes are the more liable to be made. A very little attention suffices for discriminating an inversion of the uterus from a polypus, with which it has sometimes been confounded. In short, the pedicle of a polypus is always narrow; the tumour is not very sensible, and is irreducible; whereas the uterus forms a semi-spherical swelling, sometimes a little oblong, but, always broader above, than below. It is very sensible, and may be easily reduced.

The reduction of the inverted uterus is also the only step, which can be taken, whether the accident has arisen from the weight of a polypus, or from hemorrhages. However, this proceeding is generally useless, when the disease originates from obesity. In the latter case, as the cause still continues in full force, it in general soon displaces the uterus in the same way, as before, and a pessary is the only means, to which the patient can resort. This instrument is to be worn, rather with a view of supporting the weight of the abdominal viscera, which pushes the uterus down into the vagina, as well as the fundus, through the cervix of the womb, than with any design of preventing the inversion. (*Sabatier, Médecine Opératoire, tom.* 2.)

**UTERUS, POLYPI OF.** See *Polypus.*

**UTERUS, PROLAPSUS OF.** This may take place in three different degrees. When the prolapsus occurs only in its first or second degree, the uterus is situated in the vagina, where a pyriform tumour may be felt, round which it is easy to pass the end of the finger. At the lower part of this tumour, an opening, placed transversely, may also be distinguished. In the first, or slightest degree, the uterus is situated higher up, than in the second. When the disease has proceeded to the third, or last degree, the uterus is completely protruded out of the vulva. In the latter circumstance, it always drags down the vagina, which becomes doubled on itself, and it also draws down a part of the bladder, which is connected with the upper part of the latter tube. It also sometimes happens, that some of the abdominal viscera insinuate themselves into the kind of cul-de-sac, formed by the vagina, and they then considerably increase the size of the tumour. The swelling, occasioned by a complete prolapsus of the uterus, is of an oblong, nearly cylindrical form, and it terminates below in a narrow extremity, in which a transverse opening, the os tincæ, may be discerned, from which the menses are discharged at the periods prescribed by nature. The cylindrical shape of the tumour is the more apt to lead to mistakes, as the vagina, being doubled on itself, and exposed to the effects of the air, sometimes assumes an appearance very similar to that of the skin. Hence, women, afflicted with a complete prolapsus uteri, have sometimes been regarded as hermaphrodites, in consequence of the tumour having been mistaken for a penis. Saviard has recorded an instance, in which this kind of error was made.

The inconveniences, arising from the first and second degrees of prolapsus uteri, are a sense of heaviness in the pelvis, and a degree of uneasiness in the kidneys. These complaints are aggravated, when the patient sits up or walks about. On the contrary, they diminish, and even entirely subside, when the patient has remained a certain time in bed.

The symptoms, attending a complete prolapsus uteri, are of a more severe nature. The patient experiences a greater sense of heaviness in the pelvis, and pain and dragging in the loins. She is troubled with tenesmus, and sometimes feels acute pain in the tumour itself, which is subject to inflame, and ulcerate, in consequence of its depending posture, the friction, to which it is exposed, and the irritation of the urine, as this fluid runs over it.

The uterus, when only affected with the first or second degree of prolapsus, may be easily reduced. Indeed, it often resumes its natural situation, when the patient is put in a position, in which she lies on her back, with her loins raised a little higher than her chest. When this method is insufficient, the fingers may be introduced into the vagina, for the purpose of accomplishing the reduction. The patient suffers no pain, at the time when the reduction is performed, which, for the most part, takes place spontaneously. By the latter circumstance, a prolapsus uteri may be discriminated from polypi, either of the uterus, or vagina, which tumours do not admit of being reduced, which are in shape, broader below, than above, and which present no aperture, similar to the os tincæ.

When the uterus is affected with a complete prolapsus, the reduction is not so easy of accomplishment. The great number of parts, which the displaced viscus drags downward with it, and the tumefaction, which sometimes follows, render it necessary to take some preparatory measures, before trying to replace the part in its natural situation. For this purpose, the patient should be kept in bed, be put on a low regimen, be bled, take purgative medicines, use the warm bath, and drink diluent beverages, while emollient applications are to be made to the part itself. This plan of treatment has often been attended with complete success, in cases of prolapsus uteri, of long standing and considerable size. Ruysch was against making any attempt to reduce the uterus, while this part was inflamed and swollen. He also thought, that the operation should be postponed when the uterus was in an ulcerated state. However, Sabatier observes, that, as this complication is only an accidental one, and merely arises from the friction, to which the tumour is exposed, and the irritation of the urine, the plan of immediately replacing the part cannot be attended with any danger. On the contrary, since the cause which produces and keeps up the ulceration will cease, as soon as the reduction is accomplished, it follows, that the sores will soon heal after the uterus is put into its natural situation again.

When we reflect on the position of the uterus, on the strength of the ligaments, destined to support it, and on the manner in which the vagina is connected with the surrounding parts, we cannot easily conceive, how the womb can become so much displaced, as it is in cases of complete prolapsus. It is still more difficult to com prehend, how the uterus can become displaced during pregnancy, even when this viscus has attained its utmost state of distention. However, this sort of case has frequently happened. Sabatier remarks, that he could adduce several examples, and quotes an instance from the *Traité des Accouchemens de Portal.*

The prolapsus uteri, which occurs during pregnancy, demands the utmost care. The part is capable of being reduced, while the patient is in the early stage of pregnancy. When pregnancy has far advanced, or the disease is of long standing, the reduction is difficult. Perhaps, says Sabatier, it may be more prudent in these circumstances, to let the uterus continue protruded, than to disturb the mother and fœtus with reiterated attempts to reduce the part. The uterus, however, should not be left to itself; but be well supported with a suitable bandage, and the patient ought to be kept in her bed. When the prolapsus uteri occurs at the very period of delivery, every attempt at reduction is both useless and dangerous. In this case every exertion should be made to promote the delivery of the fœtus, by gradually dilating the os tincæ, which should, at the same time, be carefully supported. The extraction of the placenta also requires a great deal of caution, and it should be accomplished by introducing a hand into the uterus, with the palm turned away from the cavity of this viscus, towards the outside of the placenta, which is to be gradually separated by proceeding from one of its edges towards its centre.

In cases of complete prolapsus uteri, Ruysch was an advocate for leaving the expulsion of the fœtus, if alive, to be effected by nature; and the same writer advises us to be content with supporting the os tincæ. But, when the child is dead, he recommends extracting it with one hand, while the uterus is supported with the other. Sabatier, however, entertains different sentiments. The expulsion of the child is not less the effect of the contraction of the diaphragm and abdominal muscles, than of the womb itself. Hence, it is easy to conclude, that when either of these agents fails in co-operating, the delivery becomes either very difficult, or impossible. This is exactly what happens in the present case; for the uterus having fallen down, can no longer be compressed by the action of the diaphragm and abdominal muscles. Sabatier sets down the practice, advised by Ruysch, as an exceedingly dangerous one; because, the efforts, made by the mother to deliver herself, would have a tendency to render the prolapsus uteri more complete, and thus increase the dragging of all those parts, with which this organ is connected. Sabatier, also, cannot discern the reason why Ruysch should recommend the line of conduct to differ, according to the different state of the child. This is, probably, quite passive in parturition, and contributes not in the least to its own expulsion. Sabatier, therefore, contends, that the treatment should not be at all influenced by the consideration of the child being dead or alive.

In whatever degree a prolapsus uteri has taken place, it is not sufficient to have reduced the part. The prolapsus would soon recur, if it were not prevented by the employment of astringent injections and pessaries.

## UTERUS, RETROVERSION OF.

A retroversion of the uterus is said to happen, when the fundus of this viscus, carried by its own weight, and forced downward by the action of the diaphragm and abdominal muscles, becomes situated between the sacrum and posterior part of the vagina, while the cervix uteri becomes inclined towards the symphysis pubis. This kind of case was not understood till about the middle of the preceding century. Sabatier states, that Gregoire, a member of the college of surgery at Paris, first mentioned it in his private instructions in midwifery. Walter Wall, an English surgeon, who had attended Gregoire, suspected, that he had met with a retroversio uteri in a woman, some months advanced in pregnancy, and he called in Dr. Hunter, in order to have the advantage of his advice. The woman was attacked with an obstinate constipation, and retention of urine, and died in about a week. A large tumour was found occupying the whole of the pelvis, and pushing the vagina against the os pubis. It had been found impracticable to push the swelling back into the abdomen, although the patient had been put on her knees and elbows, while one hand had been introduced into the vagina, and two fingers of the other hand into the rectum. Some curiosity was entertained, concerning what state things would be found in. Opening the body shewed, that the bladder, which was exceedingly full of urine, occupied almost the whole anterior part of the abdomen, in the same manner as the uterus does in the last month of pregnancy. When the bladder had been emptied, that part of it, in which the ureters terminate, and which is connected with the vagina and cervix uteri, was found raised up, as high as the upper aperture of the pelvis, by a large tumour, which filled the whole cavity of the pelvis, and was found to be the uterus. A catheter, when passed into the vagina, could be made to lift up the latter viscus, and the upper part of the tumour. This portion of the swelling, on which the bladder lay, consisted of the cervix uteri while the fundus of this organ was situated downwards towards the os coccygis and anus. The uterus had attained such a magnitude, that it could not be taken out of the pelvis, before the symphysis pubis was divided, and the two ossa innominata were pulled asunder. It was found impossible to assign any cause for the manner, in which the uterus had become displaced, as the patient had been making no exertion, had met with no fall, and had only been frightened at something just before the complaint commenced.

Dr. Hunter, struck with the singular nature of the case, thought it deserving of attention among medical men, and he made it the subject of a lecture, which he delivered to his pupils in 1754. He was afterwards consulted by several persons, who were afflicted with the retroversio uteri; but, not in so acute a way, as in the above instance. All the patients were in the third month of pregnancy, and first suffered a difficulty of making water, succeeded by a retention of urine, and afterwards by constipation. Dr. Hunter always emptied the bladder by means of a catheter and glysters, which measures sometimes effected a cure, the uterus spontaneously resuming its natural position. In every instance, the accident disappeared, when pregnancy was more advanced, and the uterus had acquired larger dimensions. Success was not always obtained; for, in some cases, in which Dr. Hunter was consulted too late, the trials to replace the uterus proved fruitless, and the women died. Dr. Hunter was so firmly convinced of the impossibility of saving patients, circumstanced in the above manner, unless extraordinary means were resorted to, that he thought one should endeavour to diminish the size of the uterus, by introducing a trocar into the body of this viscus, through the posterior parietes of the vagina, so as to let out the water of the amnios, the relative quantity of which is known to be greater, in the early, than in the advanced, stage of pregnancy.

Such a puncture might certainly be the means of the uterus resuming its natural position; but, there would be considerable danger of its exciting the contraction of the uterus, and causing abortion. No risk of this kind would be encountered by puncturing the bladder above the pubes. In this manner, a free passage would be afforded for the escape of the urine, and the reduction of the uterus might be effected.

Mr. Lynn, a surgeon in Suffolk, has seen the bladder burst, and the urine become extravasated in the abdomen, in a case of a retroversion of the uterus, in consequence of the patient's refusal to submit to the preceding operation. The woman was forty years of age, of a relaxed habit, mother of several children, and had been pregnant four months. She had been for some time before afflicted with a prolapsus of the vagina. The swelling had been a few days reduced, when, in consequence of tripping, she felt something become displaced in her abdomen, and fall towards the lower part of her back. She was immediately attacked with constipation, retention of urine, nausea, and pain in her belly. The means, which were employed, not proving effectual, Mr. Lynn suspected, that a retroversio uteri had happened, and introduced his fingers into the vagina, in order to ascertain the fact. His fingers were stopped by a tumour, as large as a child's head. The swelling occupied the back part of this passage, and descended as low as the perinæum. Being certain, that the uterus was displaced, he attempted to reduce it. The patient was put into various positions, and the fingers of one hand were introduced into the vagina, while those of the other were passed into the rectum. The use of the catheter was not forgotten; but, it could not be introduced far enough to reach the urine. Glysters were stopped at the very beginning of the rectum. The abdomen was exceedingly tense, especially, in the hypogastric region. A proposal was made to puncture the bladder; but, the patient refused to submit, and preferred being left to her fate. On the seventh day of her illness, she was very much reduced; and became affected with nausea, and hiccough, the forerunners of the mortification, which was about to happen. At length, she felt something give way in her abdomen, and, the ease, which succeeded, revived her hopes. These, however, were not of long duration; for, after being delivered of the fœtus, she sunk and died the next morning. On opening the body, the bladder was found to have sloughed and burst at several points, and two pints of urine were consequently extravasated in the abdomen.

We may conclude, from what has been stated, that the retroversio uteri is an exceedingly dangerous affection. However, it is not invariably fatal, particularly when the patient receives succour, before the disorder has made much progress. It only occurs in the early months of pregnancy, and in women, whose pelvis is very wide, while its brim is very contracted. If the uterus, which occupies a pelvis of this conformation, should be pushed back by a distended state of the bladder, and pressed against the sacrum, while the soft parts yield, the viscus, in question, becomes, as it were, wedged, and is incapable of changing its position. In this immoveable state, it presses upon the surrounding parts, and these upon it, so that a very serious train of bad symptoms are the consequence.

The first care of a practitioner, consulted in a case of retroversio uteri, should be to empty the bladder and large intestines, and to relax the parts by every possible means. Then, he should immediately proceed to replace the uterus, by placing the patient in a suitable posture, and making methodical pressure in the rectum and vagina. Should he be so fortunate as to succeed, the patient is to be confined in bed, her bowels are to be kept open, and she is to be advised always to obey the calls of nature the first moment she feels any inclination to make water. She is also to be enjoined to avoid all kinds of exertion, and wait, till the gradual enlargement of the uterus removes the possibility of this viscus descending into the pelvis. (*Sabatier, Médecine Opératoire, Tom.* 2.)

**UVA URSI.** The author of the Pharmacopœia Chir. remarks, that this plant, which was first brought into notice by De Haen, has been generally considered as a powerful remedy in calculus; but that it has not been proved, in any instance, to possess the properties of a solvent. The late Dr. Austin, however, recommended it upon the principle of its lessening the irritability of the bladder, and diminishing that secretion of diseased mucus, which, he supposed, greatly contributed to the augmentation of the stone.

Mr. Bell, of Edinburgh, strongly recommends it in that state of a gonorrhœa where the irritability of the bladder is excited in a high degree, and where the urine is loaded with viscid matter. In these cases, he directs the powder to be given in doses of a scruple or half a dram, three times a day. A remedy of this sort is certainly a great desideratum in surgery.

Dr. Saunders directs three drams of uva ursi to be macerated in a pint of hot water, and two or three ounces of the strained liquor to be given three times a day. (*Pharm. Chirurg.*)

**UVULA, AMPUTATION OF.** The uvula is subject to several kinds of enlargement, in which it becomes longer and more bulky, than natural, or in which it merely has its length increased. In consequence of such changes, it acts as an impediment to swallowing, and speaking, or else causes a disagreeable tickling at the root of the tongue, with which it comes into contact, and thus it may excite frequent retchings, and an annoying cough.

When things have attained this state, medicines are often ineffectual, and the only plan of relief consists in amputating a portion of the uvula, a very simple operation; which has been advised to be done in various ways.

The ancients recommended taking hold of the uvula with a pair of forceps, and cutting off the piece below the blades of the instrument. Celsus remarks: *Neque quidquam commodius est quàm vosella apprehendere, sub eaque, quod volumus, excindere.* Fabricius ab Aquapendente objects to this method of operating, on the ground, that it is necessary to employ both hands, so that there is a necessity for the aid of a third for holding the tongue and lower jaw. He prefers employing scissars, and leaving the left hand at liberty. When the uvula had been cut off, he advised a heated spoon to be applied to the cut end of the part, with a view of stopping the bleeding.

Paré speaks in favour of the method, preferred by Celsus. When the size of the uvula is considerable, and there is reason to fear, that the vessels will bleed freely, he recommends the application of a ligature to the part, by means of an instrument, composed of a ring, mounted on a slender handle, and formed with a groove upon its convexity. A ligature is put round the ring with a slip-knot, which is to be tightened by means of another ring, of much smaller size, mounted, like the preceding one, upon a long slender handle. The ligature is to be left in the mouth, and, when it does not seem to make sufficient constriction, it is to be tightened.

Fabricius Hildanus has subsequently described an instrument, constructed on the same principles, and applicable to the same purposes. Scultetus made use of the latter on a soldier, whose uvula was affected with the venereal disease. This author does not state, however, whether the ligature, which was applied in this way, was painful, productive of considerable inflammation, or whether the patient suffered much inconvenience from the presence of the ligature. Such effects were probably produced.

Heister, in plate 21, has given an engraving of an instrument, which was invented by a Norwegian peasant, in whose country a relaxed state of the uvula is said to be a very common affection. The contrivance was perfected by Raw. It is only necessary for me to state, that it is a kind of knife, concealed in a sheath. At the end of this last part, when the blade is drawn back, a notch is left, in which the uvula is to be engaged, and then divided by pushing the knife forwards.

Sabatier's plan of cutting off a portion of the uvula, bears a considerable resemblance to the method described by Celsus. After having placed the patient on a high chair, and in a good light, with his head properly supported, Sabatier takes hold of the uvula with a pair of forceps, made with holes in the blades, like those used for the extraction of polypi from the nose. He then divides the uvula with a pair of scissars, made with concave cutting edges, like the scissars recommended by Levret for dividing the umbilical cord. As the uvula is rendered tense with the forceps, perhaps, any other kind of scissars would answer equally well; but, Sabatier states, that those, which he uses, have the advantages of taking hold of a larger piece of the uvula, and of not letting it slip away. The perforated forceps also take hold of the part better than common ones do, from which it is apt to slip. Sabatier observes, that he has never seen any bleeding of consequence follow this trivial operation. (See *Médecine Opératoire, Tom.* 3.)

In the *First Lines of the Practice of Surgery* will be found an engraving of a pair of scissars, which seem well calculated for cutting off portions of the uvula, as they have at the end of one of their blades a transverse piece, which prevents the part, about to be cut, from slipping away.

# V.

VAGINA IMPERFORATE. It is very common to meet with female infants, born with different kinds of imperforations of the vagina. Sometimes, this passage is not completely shut up, so that the usual evacuations happen in an uninterrupted manner, and it is a considerable time before the malformation is discovered. Doubtless, there has often been occasion to obviate the defect in question, in order to qualify young women for marriage. Some females have certainly become pregnant, notwithstanding the sort of obstruction alluded to, and, in these cases, the membrane, which shuts up a part of the mouth of the vagina, has either been torn by the effects of labour, or been divided as much as was necessary for promoting this process of nature.

What is more curious, is, that there should have been found two membranes, one placed beyond the other, and obstructing the vagina. That, which is commonly met with, is nothing more than the hymen, which is thicker, and stronger, than natural. Ruysch relates, that a woman, who had been in labour three days, could not be delivered. The head presented itself; but, was prevented from coming out by the hymen, which shut up the vagina, and was very tense. Ruysch made an incision into the membrane; but, to no purpose, since there was another membrane, of a thicker texture, and situated more deeply in the passage, hindering the delivery of the child. On an incision being made into this second membrane, the child was expelled, and the case ended well.

When the vagina is completely imperforate, as soon as the time of the menses commences, a great many complaints occur, which afflict the patient with more severity, in proportion as the blood accumulates in the passage, and they may even lead to a fatal termination, when the cause is not understood, or not detected till it is too late. The complaints alluded to, are very similar to those of pregnancy; for instance, rumbling noises in the bowels, loss of appetite, nausea, vomiting, enlargement of the mammæ, spasms, convulsions, swelling of the abdomen, &c. Hence, girls, in this situation, have often been supposed to be pregnant, although they were not in a state even to become so; and some young women have been known to die, after suffering the most afflicting symptoms.

When the only malformation consists in the orifice of the vagina being shut up by a membrane, the patient may be easily relieved by a crucial incision, or a single cut, the edges of which are kept apart by a tent of suitable shape and size. Instances of the success of such an operation are to be found in numerous writers. Fabricius ab Aquapendente informs us, that a female child was born with a membrane, which completely shut up the vagina. The girl experienced no inconvenience from it, till she was about thirteen years of age, when the period of her menses began. As the blood was retained, she became afflicted with more severe pains in the loins, the lower part of the abdomen, and about the upper part of the thighs. It was supposed, that she was attacked by the sciatic gout, and she was treated accordingly. Notwithstanding the medicines, which were prescribed, she became hectic, and reduced to a complete state of marasmus, in which she passed restless nights, lost her appetite, and was delirious. A painful, very elastic tumour afterwards took place in that part of the abdomen corresponding to the uterus. The pains were aggravated every month at the period, when the patient ought to have menstruated. She was in a dying condition, when Fabricius ab Aquapendente was consulted, who, after ascertaining the real nature of the case, performed the requisite operation. A prodigious quantity of black putrid blood was discharged from the vagina; the bad symptoms gradually subsided, and the patient recovered.

It is not always equally easy to cure the imperforate vagina, when the malformation is produced by an extensive accretion of the sides of this passage to each other. The success of the operation is more doubtful, because, it is impossible to reach the situation of the blood without cutting through a considerable thickness of parts, in doing which there is some danger of wounding the rectum, or bladder. A lady, twenty-four years of age, after having tried, for eight years, such remedies as seemed best calculated for exciting the menstrual discharge, became affected with a large hard swelling of the abdomen, and a kind of herpetic affection round the body near the navel. At length, it was discovered, that the imperforation of the vagina was the sole cause of all the bad symptoms, which the patient had long endured. An incision was made, which enabled the operator to introduce his finger into a large cavity, and which gave vent to a considerable quantity of blood. It was thought, that an opening had been made into the vagina; but, the patient having died three days afterwards, it was seen, that a mistake had been made, as the cavity, in which the finger had been introduced, was that of the bladder. The vagina was closed below by a substance an inch in diameter, and half an inch thick. The upper part of this passage, the uterus, and the Fallopian tubes, were exceedingly enlarged, and filled with a dark-brown, sanious fluid. A similar fluid was found extravasated in the abdomen, and, it was discovered to have got there through a rupture, which had taken place in the Fallopian tube. The ovaries were in a natural state. De Haen, who has related this case in the sixth part of his work, intitled *Ratio Medendi*, was of opinion, that, in order to avoid opening the rectum, or bladder, only one oblique cut should be made in the membrane, which stops up the vagina, just as was advised, by Méeckren. (*Sabatier de la Médecine Opératoire, Tom.* 1.)

**VAGINA, PROLAPSUS, OR INVERSION OF.** According to Sabatier and Levret, the prolapsed part does not consist of all the coats of the vagina, in the same manner as the inverted uterus is formed of the whole substance of that viscus. These writers contend, that the lining of the vagina is alone displaced, in consequence of the swelling, and thickening, with which it is affected. Richter, however, does not accede to the opinion of Sabatier and Levret upon this point; but, describes the vagina as being liable to two kinds of prolapsus. In one case, all its tunics are stated to be included in the protrusion, the part becoming inverted at the same time that it falls down. In the other example, it is only the relaxed lining of the vagina, which descends, and makes a protrusion.

The possibility of a prolapsus of the whole of the vagina, together with all its coats, says Richter, has been doubted by Sabatier and Levret; but, without any real foundation. If it be possible for the inner coat of the vagina to separate from the external, with which it is intimately connected, (an event, which every body admits as happening in the second kind of prolapsus of the vagina,) why, asks Richter, should it be impossible for the whole of this tube, together with all its coats, to be separated from the surrounding parts, to which it is less closely adherent? Sometimes, the rectum, inclusive of all its coats, forms what is termed a *prolapsus ani*, and why may not the vagina be displaced in a similar manner, since it must be much more liable than the rectum to be propelled downwards in the violent straining at the time of delivery? Richter asks, whether every prolapsus uteri is not accompanied with such a displacement of the vagina? Cases are upon record, where the prolapsus of the vagina happened all on a sudden, in consequence of falls, the starting of a horse, &c. (*Hoin, Levret, Journal de Médecine, Tom.* 40.) Here it cannot be supposed, that the case was merely a protrusion of the inner coat, which can only be gradually relaxed and elongated. Lastly, some instances, in which the prolapsus of the vagina was several inches in length, have been gradually reduced by means of external pressure. (*Hoin.*) How can we imagine, says Richter, that such cases could proceed from any degree of relaxation, to which the membranous lining of the vagina is liable?

Richter acknowledges, however, that a prolapsus of all the coats of the vagina is much less common, than that arising from relaxation of the membranous lining of this passage; he states, that when it occurs, it is generally as a consequence of a prolapsus of the uterus; and that it cannot easily happen at all, except about the period of delivery. (See *Anfangsgr. der Wundarzneykunst; B.* 7, *Vierte Kapitel.*)

According to Sabatier, the prolapsus, or inversion, of the vagina appears like a thick, circular substance, irregularly pleated in the middle, and at the bottom of which the cervix uteri is situated, having descended further down, than natural. The prolapsed portion of the vagina increases, or diminishes, according as the patient sits up, or keeps in bed a certain time. The complaint is accompanied with a sense of heaviness in the hypogastric region; tenesmus; and a difficulty of making water, in consequence of the alteration produced in the direction of the meatus urinarius.

Such is the prolapsus of the vagina in an early state; but, when it has been of long standing, and the patients have remained, for a long while, without any assistance, the membranous lining of the passage becomes more and more thickened; the tumour, which it forms, becomes more considerable, elongated, and hardened. In this state, there still continues at the lower part of the swelling, an opening, out of which the usual evacuations are made. The grievances, which patients suffer, are similar to those arising from a prolapsus uteri, to which, indeed, the present case bears a great resemblance. The prolapsus vaginæ, however, differs, inasmuch as the tumour, formed by a descent of the uterus is very firm, and terminates in a narrow end, on which may be observed the longish transverse opening, named the os tincæ, while the tumour, arising from a prolapsus of the vagina, is soft, thicker below, than elsewhere, and ends in an irregular aperture.

Occasionally, a prolapsus of a very limited portion of the vagina is observed. This case is generally the consequence of an uncommon sort of rupture, termed the *vaginal hernia*, (See *Hernia*); but, it should also be known, that, in some cases of dropsy, a circumscribed protrusion of the vagina, in the form of a cyst, or pouch, filled with fluid, is sometimes noticed. (*Richter, Op. et loco citato.*)

When the prolapsus vaginæ is recent, the part may be easily reduced, and kept up with a pessary. The use of astringent lotions will also tend to prevent a relapse. But, when the case has been of long standing, it is neither easy to effect the reduction, nor to prevent a recurrence of the disorder. Softening, relaxing remedies, in this circumstance, are recommended, and the patient should, in particular, confine herself to her bed, and wear a T bandage, which should be made to press upon and support a piece of sponge in the orifice of the vagina.

It is reasonable to expect, that after a prolapsus vagina has continued a long while, the reduction must be difficult; because, the vagina in this state becomes affected with swelling and induration. According to the reports of Hoin and Levret, a large protrusion of this kind, ten inches in length, was so diminished by keeping the patient invariably confined in bed upon her back, that, in the course of a month, the rest of the tumour admitted of being reduced. Indeed, as Richter observes, there can be little doubt, that the treatment, which has been advised by some authors, for the diminution of very old, enormous, omental ruptures, would here be equally applicable; viz. long confinement in bed upon the back, with the buttocks somewhat elevated; unremitting, well directed external pressure; a very low diet; and repeated mercurial purges. By such means, Richter thinks, that the swelling might be in many instances sufficiently lessened to admit of reduction.

During pregnancy, a prolapsus of the whole substance of the vagina may cause much embarrassment and even danger. In one case of this description, where the protrusion was five inches in length, it became necessary to turn the child, and the displaced vagina was lacerated. The woman, however, recovered. (*Pietsch, Journal de Médécine, Tom.* 34.) In another instance, where the prolapsus became, at each return of the labour-pains, as large as a man's head, the practitioner succeeded in holding the parts back, while delivery was effected with the aid of the forceps. (See *Loder's Journal*, 1 *B. p.* 490.) When this is impracticable, it is necessary, according to Richter, to make an incision through both sides of the prolapsus; a measure, says he, to which the practitioner may the more readily make up his mind, inasmuch as the parts have, in some cases, been lacerated, without any ill consequences.

A prolapsus of the inner membrane of the vagina, while small and recent, may perhaps be removed by astringent applications. When, however, it is of long standing, indurated, and of large size, much expectation of success from this treatment cannot be entertained. Richter sees no reason why, in such a case, the superfluous relaxed part should not be cut away, especially, when the disease is accompanied with ulceration, and other serious complaints. As he observes, there can be no doubt, that a prolapsus of the inner membrane of the vagina, when limited to one part of this canal, may always be safely extirpated, either with a knife, or a ligature. (*Anfangsgr. der Wundarzn. B.* 7, *Chap.* 4.)

As the swelling of the membranous lining of this passage is folded back on itself, it sometimes increases in such a degree, that the tumour, thus occasioned, falls into a state of mortification. In this event, some writers have advised the extirpation of the swelling, justifying the practice, on the authority of some distinguished practitioners, and the little danger, attendant on the operation.

Even Sabatier only objects to this proceeding, on the ground of the danger of mistaking a prolapsus of the uterus, for one of the vagina. However, no modern surgeons in this country would hesitate about rejecting such an operation, and leaving the sloughs to separate of themselves.

The prolapsus, arising from a hernia in the vagina, can only be ascertained by attending to the symptoms, which characterize this sort of rupture. See *Hernia.*

Consult particularly *Sabatier's Médecine Opératoire, Tom.* 2, *p.* 486, *&c. Edit.* 2. *Richter's Anfangsgründe der Wundarzneykunst, B.* 7, *Vierte Kapitel.*

**VARICOCE'LE.** (from *varix*, a distended vein, and κηλη, a tumour). Many writers mean by the term *varicocele*, a varicose enlargement of the spermatic veins, which latter affection, we have, with Celsus and Pott, treated of under the name of *Cirsocele.*

Pott remarks, that the varicocele (which is an enlargement and distention of the blood-vessels of the scrotum) is very seldom an original disease, independent of any other, and, when it is, is hardly an object of surgery. The blood-vessels of the scrotum are of different size in different people; and like the vessels in other parts of the body, are liable to become varicose; but, they are seldom so much enlarged, as to be troublesome, unless such enlargement is the consequence of a disease, either of the testicle, or spermatic chord. When this is the case, the original disease is what engages our attention, and not this simple effect of it; and, therefore, considered abstractedly, the varicocele is a disease of no importance. (*Pott's Chirurgical Works, Vol.* 2.)

**VARICOSE ULCER.** See *Ulcer*, and *Varicose Veins.*

**VARICOSE VEINS.** The term, *varix*, is applied by surgeons to the permanently dilated state of a vein, attended with an accumulation of dark-coloured blood, the circulation of which is materially retarded in the affected vessel. When veins are varicose, they are not only dilated, they are also evidently elongated, presenting a cylinder larger, than natural, irregular, and in several places studded with knots. They likewise make a variety of windings, and, coiling themselves, form actual tumours from the assemblage of their convolutions in one particular place. The trunk and branches of a vein, thus dilated and elongated, constitute a very distinct swelling, when they are numerous and confined to a certain part of the body. Indeed, when the diseased vessels are situated near the integuments, the surgeon can feel, and even see, the outlines of their tortuous course. These things, for instance, are remarkably obvious in the vena saphena interna, where the affection is particularly common. This vessel may be observed to form in its course several of these swellings, in the interspaces of which, it runs in a very serpentine, tortuous manner.

Varices are most commonly observed in the lower extremities, reaching sometimes even as far up as the abdomen. They have however been noticed in the upper extremities, and, it is probable, that the whole venous system is susceptible of the affection. As a well informed writer observes; "The great venous trunks sometimes become varicose. When the disease is situated near the heart, it is attended with pulsation, which renders it liable to be mistaken for aneurism. Morgagni observed, that the jugular veins were occasionally very much dilated, and possessed a pulsation. (*Letter* 8, *art.* 9, 10, 11). He also relates a case, in which the vena azygos, for the length of a span, was so much dilated, that it might be compared with the vena cava. The patient died suddenly in consequence of the rupture of this varix into the right side of the chest. (*Letter* 26, *art.* 29.) A similar case is related by Portal, who also mentions an instance, in which the right subclavian vein was excessively dilated and burst into the chest. (*Cours d'Anatomie Medicale, tom.* 3, *p.* 354, 373.) Mr. Cline described in his lectures the case of a woman, who had a large pulsating tumour in her neck, which burst and proved fatal by hemorrhage. A sac proceeded from the internal jugular vein; the carotid artery was lodged in a groove at the posterior part of this sac. The veins of the upper extremity very rarely become varicose. Excepting cases of aneurismal varix, the only instance of this disease, with which I am acquainted, is mentioned by Petit. (*Traité des Maladies Chir. tom.* 2, *p.* 49.) In this case, a varix was situated at the bend of the arm: the patient was so fat, that no other vein could be found for the purpose of venesection, which operation Petit repeatedly performed by puncturing this varix. The superficial epigastric veins sometimes become varicose, but, the most frequent seats of this disease are the venæ saphenæ, the spermatic, and hemorrhoidal veins." (See *Hodgson's Treatise on the Diseases of Arteries and Veins, p.* 538—539.) The deep seated veins of the extremities seldom become varicose. The disease rarely occurs before the adult period of life, and its progress is extremely slow. It is very frequently remarked in pregnant women, who have passed a certain age; but, it is particularly unusual for it to happen in young women, even during a series of repeated pregnancies. Surgeons have not hitherto made out any very precise information, respecting the places, climates, and kinds of constitution, which promote the occurrence of a varicose enlargement of the veins. Nor has it been well proved, that the disease often proceeds from swellings of the abdominal viscera, or any other species of tumour capable of mechanically obstructing the venous circulation. One or more veins of the same limb are at first most commonly affected with a slight degree of dilatation, without pain, or any sensation of uneasiness. This beginning change ordinarily advances with great slowness, except in cases, where it accompanies pregnancy, in which circumstance, one, or both the lower extremities, as early as the first months, are frequently seen covered with largely dilated veins, or even with tumours formed by an assemblage of varices. The veins gradually become more and more distended, lengthened, coiled up, and tortuous. The patient then begins to complain of a sense of heaviness, numbness, and sometimes of very acute wandering pain, through the whole of the affected limb. In a more advanced stage, in proportion as the varices increase, and especially when the dilated veins actually form tumours, the limb swells, and becomes more or less œdematous according to the extent of the disease, and the time which it has existed. M. Delpech thinks, however, that the œdema in this case is not such as to justify the conclusion, that the increased size of the veins, and the way in which they distend the integuments, produce a mechanical interruption of the function of the absorbent system. For, says he, we meet with, though not often, enormous varices, which are not attended with any swelling of the cellular substance; and we still more frequently see cases, in which there is a considerable degree of œdema, while the varices are scarcely remarkable. When the latter have prevailed a long while, and made much progress, the coats of the affected veins are not unfrequently thickened, swelled, and indurated, forming a sort of half-canal, or solid tube, which has been regarded as an excavation made by the pressure of the varix against the neighbouring bone. But, the same phenomena are equally observable, when varicose veins lie at a distance from any bone, against which they can be pressed. As Mr. Hodgson remarks, "the blood occasionally deposits strings of coagulum in varicose veins: when this is the case, the vessel is incapable of being emptied by pressure, and is firm to the touch. The deposition does not in general fill the vessel, but, by diminishing its calibre, it retards the flow of blood, and causes the dilatation to increase in the inferior portion of the vein, and in the branches, which open into it." (*On the Diseases of Arteries and Veins, p.* 541.) This gentleman has seen four cases, in which the coagulum accumulated to such an extent, that the canals of the dilated vessels were obliterated, and a spontaneous cure was the consequence. The excessive distention of the coats of a superficial vein produces an inflammatory irritation, at first in the adjoining cellular membrane, and afterwards in the integuments. These organs become at first connected together by the adhesive inflammation; and, if the distention continue to operate, they may at length ulcerate, and burst, and hemorrhage be the consequence. In such cases, the effusion of blood has sometimes been very considerable; but, says M. Delpech, we have no example of its having proved dangerous. The syncope following it, or a moderate compression, has sufficed for its stoppage. A more common occurrence, than bleeding, is the coagulation of the blood in the cavity of a varicose vein. The vessel then becomes hard and incompressible, and it loses that elastic yielding softness, which renders it capable of being diminished by gentle pressure. If the parts be already inflamed, Delpech conceives, that the clot in the diseased vein may act as an extraneous body, and bring on ulceration, by the effects of which it is at last brought into view. In this sort of case, it is extremely uncommon for hemorrhage to occur; for, in general, the vessel has been already obliterated by the preceding inflammation. But, the ulcer itself is very difficult to heal, and may be kept up a long while by the œdematous swelling of the limb. Varices, or rather the œdema, which is the consequence of them, has the same effect upon every other species of ulcer, and even upon the most simple solution of continuity. While the swelling of the limb cannot be dispersed; while the edges of a solution of continuity are kept asunder by the tense state of the skin; and while the divided parts are irritated by this painful tension; every thing is unfavourable to cicatrization. Thus, we see the most simple wounds, which have been allowed to suppurate, and ulcers, which should have healed rapidly, continue uncured a great many years, merely because the limbs, on which they are situated, are affected with an œdematous swelling, the consequence of varices. Such is the condition of things in the case, which has been improperly named the *varicose ulcer*. (*Delpech, Précis des Maladies Chir. tom.* 3, *sect.* 8, *art.* 3.)

In the investigation of the causes of varices, it is usual to dwell very much upon the mechanical obstructions, which may affect the circulation of the blood in the veins. Surgeons have thought themselves justified in regarding this as the only cause, because a circular, moderate compression incontestably retards the course of the blood in these vessels, and produces a temporary dilatation of them. The opinion has seemed also to derive confirmation from the knotty appearance of varicose veins, a circumstance, which has been accounted for by supposing, that the distention is greatest in the situation of the valves. Lastly, the idea is further supported by the well known fact of the frequent occurrence of varices during the state of pregnancy. But, it has not been remembered, that the use of garters, for example, is extremely common; yet varices of the legs are infinitely less frequent; that very large varices are met with in persons, who have never employed any kind of ligatures, to which the origin of the complaint can be imputed; that when the dilatation of the veins extends to the thighs and parietes of the abdomen, no causes of this description even admit of suspicion; that varicose veins are observable round several kinds of tumours, especially scirrhi, when there is no possibility of pointing out any mechanical obstruction to the circulation of the blood; that varices sometimes make their appearance at the commencement of pregnancy, and long before the enlargement of the womb can impede the free return of the blood through the veins in the pelvis; that nothing is more unusual, than a varicose dilatation of the veins of the lower extremities in consequence of swellings of the abdominal viscera; and, lastly, it has been forgotten, that the knots of the dilated veins are far too numerous to admit of being ascribed to the resistance of the valves. It cannot be denied, that pressure, applied in the track of the vessels, tends to promote their dilatation: but, it can neither be considered as the only cause, nor as the principal one. The foregoing observations, made by Delpech, render it probable, that some unknown general cause is concerned in producing varices, the formation of which may also be facilitated by the impediments to the free return of the blood, occasioned by certain attitudes, and particular articles of clothing.

Mr. Hodgson conceives it probable, that, in some instances, the valves are ruptured, in consequence of muscular exertions, or external violence, in which cases, the pressure of the column of blood is the first cause of the dilatation of the veins. Sometimes also the disease appears to arise from preternatural weakness in the coats of the veins, as, in those instances, in which, without any evident cause, it exists in various parts of the same person. (*Treatise on the Diseases of Arteries and Veins*, p. 537.)

Experience proves, says Delpech, that there is no certain mode of curing *varices*, strictly so called, which he thinks cannot be wondered at, since the nature and causes of the disease are completely unknown. The same source of knowledge, however, also proves, that the increase in the dilatation of varicose veins may be retarded, and that the œdematous swelling, attendant on the complaint, may be beneficially opposed. But, these effects cannot be produced by resolvent, tonic, astringent applications, nor by aperient, diuretic, and purgative remedies, as some even of the latest writers so inconsiderately assert; but, only by means of methodical and permanent compression. When the whole of a limb, affected with varices, is subjected to this last mode of treatment, the dilated veins subside, the circulation is more regularly performed, and the œdema and pain cease. There is not (says Delpech) any better method of healing the solutions of continuity in the soft parts, produced, or kept up, by the varicose state of the limb, and its consequences. But, as soon as the compression is discontinued, the varices make their appearance again, the pain recurs, the œdema returns, and the ulcers, which were healed, break out afresh. Compression, therefore, which absolutely requires to be constantly employed, can be regarded only as a palliative, the more useful, indeed, inasmuch as the changes, which it brings about in the state of things, are nearly equivalent to a perfect cure.

Inflammation of the integuments covering a varix, or varicose tumour, cannot invariably be prevented by compression; nor will this treatment always succeed even in removing the intolerable pain, which sometimes attends numerous clusters of varicose veins. In the first case, rest and relaxing applications will often succeed; and in the second, the topical use of sedatives frequently gives relief. It has been proposed to puncture and empty varicose veins; but, if a temporary emptiness and relaxation of these vessels, which are rendered painful by their distention, could remove the pain for a time, things would fall into the old state again in the course of a few days. If it should appear, also, that the clotted blood had the effect of keeping up the unfavourable symptoms, it would be necessary to make a very free opening into the dilated vein, in order that the coagulum might be extracted. In such a case, it would be useless to tie the vessel above and below the opening, as has been recommended: the slightest compression is afterwards sufficient for the stoppage of the bleeding, and by the subsequent inflammation the vessel is certain of being obliterated.

We learn from Celsus, that the ancients were accustomed to remove varices by excision, or destroy them with the cautery. (*De Re Medicâ, lib.* 7, *cap.* 3.) When the vein was much convoluted, extirpation with the knife was preferred: but in other cases, the dilated vessel was exposed by an incision, and then cauterized. Petit, Boyer, and many surgeons in this country, have also sometimes practised the operation of cutting out clusters of varicose veins.

Delpech remarks, that the extirpation of tumours, composed of numerous varices, has been practised, either for the purpose of removing the pain in the situation of the disease, or other inconveniences. This operation has been successfully performed; but it appears also not to have constantly had the effect of preventing the formation of new varices, and it has sometimes proved tedious, difficult, and severely painful in its execution. In fact, an erroneous judgment must necessarily be formed of the extent of these swellings, when they are judged of only from the appearance, which they present under the skin. When we attempt to operate (says Delpech), we may be led to organs, which ought not to be meddled with, and a long, and extremely painful, dissection may be found requisite. Besides, varices are not always confined to the superficial veins, and a relapse would be inevitable. These reflections tend to the conclusion, that operations of this sort should never be undertaken, except when the disease is accompanied with perilous symptoms, or nearly deprives the patient of the use of his limb.

It has been thought, that one of the established principles in the treatment of aneurisms might be advantageously extended to the cure of varicose veins. By tying the principal venous trunk above the point, to which the varicose affection reaches, it is said, that the course of the blood in the morbid vessels may be totally stopped; the column of this fluid contained in them made to coagulate; and the consequent obliteration of the vessels themselves accomplished.

The practice of tying veins for the cure of varices, appears to have been employed in the days of Paré and Dionis (*Cours d'Operations de Chirurgie, p.* 610.) who have accurately described the operation of tying and dividing the vein between the two ligatures. Sir Everard Home has related many cases of varicose veins in the leg, some of them being accompanied with tedious ulcers, in which, after tying the vena saphena major, where it passes over the inside of the knee, not only the dilatation of the veins of the leg was relieved, but the ulcers were readily healed.

This proceeding has unquestionably been sometimes followed with success; but, it has also had its failures. Amongst other evils, an inflammation of the tied vein has been observed, extending very far in the vessel, and succeeded by convulsions and death. Indeed, the dangers, arising from an inflammation of the internal coat of the veins, are now generally acknowledged, and every endeavour should be made to avoid them. A case, which lately happened in one of the large hospitals of this metropolis, has fully proved them: we allude to the example, in which the femoral vein happened to be wounded in the operation for aneurism, and had a ligature applied round the small aperture accidentally made in it. Inflammation of its internal coat took place to a considerable extent, and the patient is supposed to have died of the indisposition resulting from it.

As Mr. Brodie observes, it seems to be now established by the experience of modern surgeons, that a mechanical injury, inflicted on the trunk of one of the larger veins, is liable to be followed by inflammation of its internal membrane, and a fever of a very serious nature; and the occasional occurrence of these symptoms after the ligature, or even the simple division of the vena saphæna, has made surgeons less confident, than formerly, of the propriety of attempting these operations for the relief of a varicose state of the branches of that vessel in the leg. Certain reflections, however, induced Mr. Brodie to think, that the same ill effects would not follow a similar operation performed on the branches themselves. "Where the whole of the veins of the leg are in a state of morbid dilatation, and the distress produced by the disease is not referred to any particular part, there seem to be no reasonable expectations of benefit, except from the uniform pressure of a well-applied bandage. But, not unfrequently, we find an ulcer, which is irritable, and difficult to heal on account of its connexion with some varicose vessels; or without being accompanied by an ulcer, there is a varix in one part of the leg, painful, and perhaps liable to bleed, while the veins in other parts are nearly in a natural state, or, at any rate, are not the source of particular uneasiness. In some of these cases, I formerly applied the caustic potash, so as to make a slough of the skin and veins beneath it; but, I found the relief, which the patient experienced from the cure of the varix, to afford but an inadequate compensation for the pain, to which he was subjected by the use of the caustic, and the inconvenience arising from the tedious healing of the ulcer, which remained after the separation of the slough.

"In other cases, I made an incision with a scalpel through the varix and skin over it. This destroyed the varix as completely as it was destroyed by the caustic, and I found it to be preferable to the use of the caustic, as the operation occasioned less pain, and as in consequence of there being no loss of substance, the wound was cicatrized in a much shorter space of time. I employed the operation, such as I have described it, with advantage in several instances; but, some months ago, I made an improvement in the method of performing it, by which it is much simplified; rendered less formidable not only in appearance, but also in reality; and followed by an equally certain, but, more speedy cure.

"It is evident (says Mr. Brodie), that the extensive division of the skin over a varix can be attended with no advantage. On the contrary, there must be a disadvantage in it, as a certain time will necessarily be required for the cicatrization of the external wound. The improvement, to which I allude, consists in this; the varicose vessels are completely divided, while the skin over them is preserved entire, with the exception of a moderate puncture, which is necessary for the introduction of the instrument, with which the incision of the veins is effected. Thus the wound of the internal parts is placed under the most favourable circumstances for being healed, and the patient avoids the more tedious process, which is necessary for the cicatrization of a wound in the skin above.

"For this operation, I have generally employed a narrow, sharp-pointed bistoury, slightly curved, with its cutting edge on the convex side.—Having ascertained the precise situation of the vein, or cluster of veins, from which the distress of the patient appears principally to arise, I introduce the point of the bistoury through the skin on one side of the varix, and pass it on between the skin and the vein, with one of the flat surfaces turned forwards, and the other backwards, until it reaches the opposite side. I then turn the cutting edge of the bistoury backwards, and in withdrawing the instrument, the division of the varix is effected. The patient experiences pain, which is occasionally severe, but subsides in the course of a short time. There is always hemorrhage, which would be often profuse, if neglected, but which is readily stopped by a moderate pressure, made by means of a compress and bandage carefully applied." Mr. Brodie particularly enjoins the necessity of keeping the patient quietly in bed for four or five days after the operation, and removing the bandage and first dressings with the utmost care and gentleness. He also cautions surgeons not to make the incision more deeply, than absolutely necessary. Inflammation of the coats of the veins has not occurred in any of the cases, in which M. Brodie has adopted this method of treatment. This gentleman wishes it to be understood, however, that he does not recommend the practice indiscriminately, but with a due attention to the circumstances of each individual case. "The cases, for which it is fitted, are, not those, in which the veins of the leg generally are varicose; or in which the patient has little, or no inconvenience from the complaint; but those in which there is considerable pain referred to a particular varix; or in which hemorrhage is liable to take place from the giving way of the dilated vessels; or in which they occasion an irritable and obstinate varicose ulcer." (See *Medico-Chir. Trans. Vol.* 7. *p.* 195, *et seq.*)

On the subject of cutting through veins affected with varix, it is proper to observe, that even this plan has been known to bring on severe and fatal symptoms. Cases confirming this fact are recorded in a valuable modern work, which should be in the hands of every practical surgeon. (See *Hodgson's Treatise on the Diseases of Arteries and Veins, p.* 555, *et seq.*) It is but justice to state, however, that, in these examples, Mr. Brodie's manner of doing the operation was not adopted.

As we have already noticed, cases of spontaneous varix in the veins of the arm are rarely observed. When these vessels become varicose, it is almost always in consequence of a communication being formed, in the operation of venesection, between the brachial artery and one of the veins at the bend of the arm. The superficial veins in this situation then become more or less dilated, by the impulse of the stream of arterial blood, which is thrown into them. There is however a good deal of difference, between these accidental varices, actually induced by a mechanical cause, and those which originate spontaneously, or from causes not very clearly understood. The former never acquire the size, which the latter often attain; they never exceed a certain magnitude, whether pressure be employed or not; they never form tumours composed of an assemblage of varicose veins; they are never filled with tough coagula of blood; their coats are never thickened, nor constitute the solid half canal remarked in the other species of varices; the skin, which covers them, is not disposed to inflame and ulcerate; they are not subject to occasional hemorrhage; and the limb is not affected with any œdematous swelling. (See *Delpech Traité des Maladies Chir. Tom.* 3, *p.* 261.) These circumstances must render it sufficiently evident, that all surgical interference in such a case would be entirely unnecessary.

For additional observations, connected with the subject of varicose veins, see the articles, *Aneurism*, where the aneurismal varix is described; *Cirsocele*, where the varix of the spermatic chord is treated of; *Hemorrhoids*, where the diseased and enlarged veins of the rectum are considered; *Varicocele*, where those of the scrotum are noticed.

VA'RIX. (from *varius*, unequal.) The term *varices* is applied to a kind of knotty, unequal, dark-coloured swellings, arising from a morbid dilatation of veins. (See *Varicose Veins.*)

**VEINS, DISEASES OF.** Many diseases of veins are noticed in various parts of this Dictionary. For instance, the Aneurismal Varix is particularly described in the article *Aneurism;* the inflammation of the membranous lining of veins is noticed under the head of *Bleeding*, of which operation it is an occasional ill consequence. The varicose affection of the veins of the testicle is treated of in *Cirsocele.* Diseases of the veins of the rectum, are considered in the observations on *Hemorrhoids.* The nature, symptoms, and treatment, of varices in general are explained in the article *Varicose Veins.* I shall now briefly annex a few additional remarks on the principal diseases of the venous system, in order to render what has been already stated in other parts of the work more complete.

It is justly observed by Mr. Hodgson, that " the veins are liable to all those morbid changes, which are common to soft parts in general; but, the membranous lining of these vessels is peculiarly susceptible of inflammation. When a vein is wounded, the inflammation, which is the effect of the injury, sometimes extends along the lining of the vessel, into the principal venous trunks, and in some instances even to the membrane, which lines the cavities of the heart. This inflammation sometimes produces an effusion of coagulating lymph, by which the opposite sides of the vein are united, so as to obliterate the tube; in this manner a great extent of the vessel is occasionally converted into a solid cord. In some instances, the secretion of pus into the cavity of the vessel is the consequence of inflammation of the membranous lining of veins: under these circumstances, the matter is either mixed with the circulating blood, or, the inflammation having produced adhesion of the sides of the vessel at certain intervals, boundaries are formed to the collection of pus, which in this manner form a chain of abscesses in the course of the vessel.

" When the inflammation of veins is not very extensive, its symptoms are the same as those of local inflammation in general; but, when the inflammation extends into the principal venous trunks, and pus is secreted into the vessel, it is accompanied with a high degree of constitutional irritation, and with symptoms, which bear a striking resemblance to those of typhus fever." (See *Hodgson's Treatise on the Diseases of Arteries and Veins, p.* 511—512.)

I was lately informed of a case, in which a patient, who had undergone the operation for the cure of an aneurism in the thigh, died in consequence of an inflammation, which soon afterwards affected the lining of the femoral vein, and extended a considerable way upwards towards the heart. In the operation, the vein had been accidentally punctured, and in order to stop the bleeding from it, the little opening was surrounded and tied with a very fine ligature, the vessel being left in a pervious state. This case happened in one of the principal hospitals of London, and it tends to confirm a fact, which is now well known to surgeons, that the application of ligatures to veins is by no means exempt from the risk of very serious and even fatal consequences. Hence, arises one of the most weighty objections, which have been urged against the practice of tying the trunks of varicose veins, with a view of curing the morbid dilatation of these vessels, and its effects upon the limb.

Inflammation frequently produces a thickening of the coats of the veins, as well as adhesion of their sides, and obliteration of their cavities. Indeed, in some instances, these vessels have been found to resemble arteries in the thickness of their coats, and in retaining a circular form when cut across. (*Hodgson, op. cit. p.* 513.)

Ulceration sometimes extends to the coats of veins, and, by exposing their cavities, gives rise to hemorrhage. In certain examples, it commences in the membranous lining, and destroys the other coats. In general, however, the adhesive inflammation precedes the ulcerative, and by obliterating the cavities of these vessels, prevents the occurrence of hemorrhage. When sphacelation takes place in the vicinity of veins, their cavities, like those of arteries under similar circumstances, are filled with extensive plugs of coagulum, which prevent hemorrhage upon the separation of the mortified part.

Veins are sometimes ruptured, without any previous morbid alteration in their structure, and the accident may be induced by muscular exertions, external violence, the sudden effects of the cold bath, &c.

Although a deposition of calcareous matter almost invariably takes place in the arteries of persons advanced in life, it is an extremely rare occurrence in the coats of veins.

Loose calculi have been found in the cavities of veins.

Tumours sometimes grow from the lining of veins. In a case of scirrhous pylorus, Mr. Hodgson found a tumour, larger than a hazel nut, growing from the lining of the splenic vein, and resembling in its appearance and consistence the disease, which existed at the pylorus. (*P.* 524.)

The venous, like the arterial system, appears to be capable of carrying on a collateral circulation, when any part of it is impervious. Even after the obliteration of the vena cava inferior, the blood has been known to be conveyed with facility to the heart through the lumbar veins and vena azygos. In the case, recorded by Dr. Baillie, (*Trans. of a Society for the Improvement of Medical and Chir. Knowledge, Vol. 1, p. 127*) it is remarkable, that the vena cava inferior was obliterated where the venæ cavæ hepaticæ opened into it, so that not only the blood from the lower extremities, but also that from the liver, must have passed through collateral channels to the heart.

For a great deal of important additional information on the foregoing topics, I must refer to Mr. Hodgson's excellent Treatise on the Diseases of Arteries and Veins.

**VENEREAL DISEASE.** (*Lues Venerea. Morbus Gallicus. Syphilis,* or *Siphilis.*) About the year 1494, or 1495, the venereal disease is said to have made its first appearance in Europe. Some writers are of opinion, that the distemper originally broke out at the siege of Naples; but, most of them have supposed, that, as Columbus returned from his first expedition to the West Indies, about the above period, his followers brought the disorder with them from the new to the old world. Other authors, among whom is Mr. B. Bell, maintain the opinion, that many arguments might be adduced to shew, that the venereal disease was well known upon the old continent, and that it prevailed among the Jews, Greeks, and Romans, and their descendants, long before the discovery of America.

Marcellus Cumanus, Johannes de Vigo, and other early writers on the lues venerea, have left an account of some of the symptoms, and their description, as far as it extends, is found to agree with the appearances, observed even at the present day. Marcellus remarks: "I observed many of the officers and foot soldiers in Milan, while I was in the camp at Navarre, to have several scabs, or pustules, breaking out on the face, and spreading all over the rest of their bodies. The first of which appeared usually under the præputium, or on the outside, like a grain of millet, sometimes behind the glans, with a small itching. At other times, a single pustule would arise, like a little bladder, without much pain, but, itching also. If rubbed, or scratched, there arose an ulcer, corrosive and smarting, like the sting of an ant." &c. (Vide *Astruc, Vol. 2, p. 226, translated by Dr. Barrowby.*)

Johannes de Vigo notices the way in which the disease is communicated by a chancre, in a still more particular and accurate manner: *ejus origo in partibus genitalibus, viz. in vulvâ in mulieribus, et in virgâ in hominibus, semper ferè fuit cum pustulis parvis, interdum lividi coloris, aliquando nigri, nonnunquam subalbidi cum callositate eas circumdante.*" De Morbo Gallico. These quotations prove, that the venereal disease was propagated in the beginning, as it now is, by what the old writers called a *pustule*, and we name a *chancre*.

The venereal disease arises from a morbid poison, which when applied to the human body, has the power of propagating, or multiplying itself, and is capable of acting both locally and constitutionally.

As Mr. Hunter remarks, in whatever manner the venereal poison arose, it certainly began in the human race, as no other animal seems capable of being affected by it. The parts of generation were, probably, also, the first affected; for, if the disease had taken place in any other part of the body, in all probability, it would never have gone further, than the person in whom it first arose. However, since it was situated in the parts of generation, where the only natural connexion takes place, between one human being and another, except that between the mother and child, it was in the most favourable situation for being propagated; and Mr. Hunter infers, also, that the first effects of the disease must have been local, in consequence of the fact, now well established, that none of the constitutional effects are communicable to other persons.

The particular properties of the venereal poison are quite unknown, its effects on the human body being the only information which we possess concerning it. Mr. Hunter says, that it is commonly in the form of pus, or mixed with pus, or some other secretion. The virus excites, in most cases, an inflammation in the parts contaminated, which inflammation is attended with a specific mode of action, which is different from all other actions attending inflammation, and which, according to Mr. Hunter, produces the specific quality in the matter.

The formation of matter, though a general, is not a very constant attendant on this disease; for, inflammation, produced by the venereal poison, sometimes does not terminate in suppuration. But, if Mr. Hunter's sentiments are correct, it is the matter produced, whether with, or without inflammation, which alone contains the poison. Hence, a person, having the venereal irritation in any form, not attended with a discharge, cannot communicate the disease to another. In proof of this doctrine, the above-mentioned distinguished writer states, that, though married men often contract the disease, and continue to cohabit with their wives, even for weeks, yet, in the whole of his practice, he never once found, that the complaint was communicated under such circumstances, except when connexion had been continued, after the discharge had appeared.

That excellent surgeon, Mr. Hey of

Leeds, has however given it as his opinion, founded upon several instances, that a man may communicate the lues venerea, after all the symptoms of the disease have been removed, and he is judged to be in perfect health. (See *Medical and Chir. Trans. Vol.* 7, *p.* 547.) This sentiment appears so repugnant to every thing, which has hitherto been taught upon the subject, that surgeons should not be too hasty in adopting it. The very case, which Mr. Hey has adduced to prove the occurrence, is decidedly inadequate to the intended purpose, in consequence of the impossibility of trusting to the accounts, which patients give of themselves in cases of this description. In the case, recited by Mr. Hey, the gentleman might have had some venereal affection at the period of, or subsequently to, his marriage; and yet his feelings, and a sense of the disgrace of infecting a virtuous woman might compel him to conceal the real truth from his surgeon. Again, it is to be remembered, that the lady herself might have deviated from the path of chastity, and exposed herself to infection; and, if she had done so, she would have informed neither her husband, nor Mr. Hey. I confess, it is painful at all times to suspect the veracity and honour of individuals, whose situations in life are respectable; but, whenever an occurrence takes place, which is known to be contrary to the known laws of disease, every possibility is to be recollected, in order to avoid the necessity of admitting doctrines, which do not coincide with the facts of general experience.

Mr. Hey believes in the possibility of the venereal disease being communicated to the fœtus in utero by the mother. An universal desquamation of the cuticle; a hoarse squeaking voice; copper-coloured blotches; a scaly eruption upon the chin; and an unnatural redness of the anus; are the common symptoms, which Mr. Hey sets down as proofs of syphilis in very young infants, which have been thus infected, and his sentiment is favoured by these complaints having yielded to small doses of the submuriate of mercury, the hydrargyrus cum creta, &c. (See *Medical and Chir. Trans. Vol.* 7, *p.* 542—548, *&c.*)

It is possible to conceive, that the venereal poison may be in so diluted a state, as to be quite incapable of exciting any degree of irritation, and, consequently, that no effects would be produced. However, when the poison has the power of irritating the part to which it is applied, the same consequences will follow, whether from a large, or small quantity; from a strong, or weak solution.

The same matter, however, may affect different persons very differently. Two men sometimes have connexion with the same woman; both catch the disease; but, one may have very severe, the other exceedingly mild symptoms. Mr. Hunter adds, that he has known one man give the disease to different women, and some of the women have had it with great severity, while others have suffered very slightly.

I think there cannot be a doubt, that climate and constitution have important influence over the venereal disease. It is a well known fact, that, in all warm countries, this disorder, as far as it regards the natives, and those who have been long settled there, is not only much milder in its symptoms, but much more easy of cure. In the West Indies, the Brazils, &c. it is not uncommonly cured by means of sarsaparilla, guaiacum, mezereon, &c. without a grain of mercury. It is to be understood, that this mildness of syphilitic complaints, and their facility of cure, in warm climates, do not extend to strangers, who have recently arrived there. On the contrary, these persons, when infected in such countries, suffer more from the virulence of the disease, than they would in their native climate. In Portugal, during the late war, the dreadful ravages of the venereal disease amongst the British soldiers, and its comparatively milder phenomena amongst the inhabitants of the country, were particularly noticed by all our surgeons employed on that service. "In the British army, (says Mr. Fergusson) it is probable, that more men have sustained the most melancholy of all mutilations, during the four years that it has been in Portugal, through this disease, than the registers of all the hospitals in England could produce for the last century; while venereal ulceration has not only been more intractable to the operation of mercury, than under similar circumstances at home, but the constitution, while strongly under the influence of the remedy, has become affected with the secondary symptoms in a proportion that could not have been expected. With the natives, on the contrary, the disease is very mild; curable, for the most part, by topical treatment alone, or wearing itself out when received into the constitution, after running a certain course, not always a very destructive one, without the use of any adequate mercurial remedy. This is seldom confessed by the practitioners of the country, who deeply feel and resent the ridicule, that has been cast upon them by foreigners, as much for the prevalence of the disease, as their supposed ignorance in treating it; and therefore they generally profess themselves to be advocates for mercury, and adepts in its use; but, the fact is not so, and I can aver, that the bulk of the people, and of all the military at the hospitals, even though a general order has been given out enjoining the use of mercury, cure themselves, or get cured, by other means. I have now been upwards of two years at the head of their hospital department, and I can declare, that it never occurred to me, amongst all the venereal patients, whom in that time I have seen pass through the hospitals, to meet a single one under the influence of mercury, excepting those cases, wherein I myself have personally superintended its administration. They go out cured by topical remedies alone; and I have lived long enough amongst them to ascertain, that their return to hospital under such circumstances for secondary symptoms, is far from being an universal, or even a frequent occurrence. (*Fergusson, in Medical and Chirurgical Trans. Vol.* 4, *p.* 1—2.)

This gentleman infers, that, in Portugal, the disease is exhausted, and has lost a good deal of its virulence. He is led to adopt this opinion, not only from the facility of its cure, but also from the analogy of the natural small-pox, which, though the uses of inoculation and vaccination are well known to the regular faculty in Portugal, has been permitted, through the prejudices of the people, and defect of public spirit, to run its natural course unresisted amongst the bulk of the inhabitants, and has now changed into a mild disease, which does well under any mode of treatment. "Yet (says Mr. Fergusson) I have no doubt, that were this mild disease, or the mildest that was ever produced from the improved inoculation of England, communicated to a tribe of Indians, or to a plantation of negroes, or any other class of people, who had never before known the small pox, it would desolate with all the fury of pestilence, destroying whereever it could find victims, and never ceasing until it had destroyed the whole."

"All adventitious diseases, whether chronic or acute, all, in fact, that are not connate, endemic, and sporadic, appear more or less to run this course of exhausting themselves, while retained upon the same ground to which they have been transplanted; but, let the field be changed in any degree, and fresh sources of developement be presented, they instantly resume their primary powers, and taking a fresh departure of violence, repeat the almost forgotten inflictions of their original visitation.—Similar to the above appears to be the inoculation of the exhausted syphilitic virus of Portugal (though evidently the same disease) into the constitution of the British, or other stranger. It is in some measure new, therefore unfriendly; and seems to have the power of exciting new actions of more than ordinary violence, and requiring curative means of more than common efficacy to arrest its progress. I need scarcely say, that this new organization of disease in the stranger, cannot be combated by such means as the natives employ to cure themselves." (*Fergusson in Medical and Chir. Trans. Vol.* 4, *p.* 7—10.)

It is a great contested question, in the subject of the venereal disease, whether this malady and gonorrhœa arise from the same poison? Mr. Hunter acknowledges, that the opinion, of their originating from two distinct poisons, seems to have some foundation, when we consider the difference in the symptoms, and method of cure. But, the same author contends, that, if we take up this question upon other grounds, and, also, have recourse to experiments, the result of which we can also safely depend upon, we shall find this notion to be erroneous. I shall not repeat, in this place, the arguments, adduced by Hunter in support of the doctrine, that both diseases are produced by the same virus; the reader will find some notice taken of them in the article *Gonorrhœa.*

Mr. B. Bell, and several other writers, have supported an opinion, contrary to that promulgated by John Hunter, relative to the poison, from which lues venerea, and gonorrhœa arise, and, indeed, after impartially considering the evidence brought forward by the two opposite parties, I feel much inclined to believe, that the two diseases do not originate from the same virus. Mr. Hunter, it is true, has brought forward some observations tending to shew, that, a chancre and other venereal symptoms, following absorption from such chancre, might be communicated by inoculating a person with the matter of a gonorrhœa. However, in speaking of *gonorrhœa,* I have suggested some reasons for not placing implicit belief in the inferences, which Mr. Hunter has drawn.

Mr. B. Bell adduces some facts, from which an almost decisive conclusion may be made, that the poisons of the venereal disease, and the gonorrhœa, are entirely different and distinct. Mr. Bell observes, that, on a subject such as this, the names of persons, by whom the following experiments were conducted, cannot be mentioned; but, he is personally acquainted with all of them, and he believes his friend, Dr. Duncan, saw the progress of some of the cases. Mr. Bell knows, that all which they relate, may be with certainty relied on, and he explains, what was done, in nearly their own words.

One gentleman states: "My experiments were made a good many years ago, and were meant to form the subject of a paper for a medical society, of which I am a member. I had no theory to support, nor any other view in making them, than to support the opinion, at that time generally received among practitioners, namely, that lues venerea and gonorrhœa virulenta, are one and the same disease, arising from the same matter of contagion, acting in a different manner on different surfaces. I was soon, however, convinced, by the very distressful and unexpected event of my experiments of the fallacy of this opinion.

"Matter was taken upon the point of a probe, from a chancre on the glans penis, before any application was made to it, and completely introduced into the urethra, expecting thereby to produce a gonorrhœa. For the first eight days, I felt no kind of uneasiness; but, about this period, I was attacked with pain in passing my water. On dilating the urethra, as much as possible, nearly the whole of a large chancre was discovered, and, in a few days thereafter, a bubo formed in each groin. No discharge took place from the urethra, during the whole course of the disease; but another chancre was soon perceived in the opposite side of the urethra, and red precipitate was applied to it, as well as to the other, by means of a probe previously moistened for the purpose. Mercurial ointment was at the same time rubbed on the outside of each thigh, by which a profuse salivation was excited. The buboes, which, till then, had continued to increase, became stationary, and, at last, disappeared entirely; the chancres became clean, and, by a due continuance of mercury, a complete cure was at last obtained."

Mr. B. Bell informs us, that the next experiment was made with the matter of gonorrhœa; a portion of which was introduced between the prepuce and glans, and allowed to remain there without being disturbed. In the course of the second day, a slight degree of inflammation was produced, succeeded by a discharge of matter, which, in the course of two or three days, disappeared.

The same experiment was, by the same gentleman, repeated once and again, after rendering the parts tender, to which the matter of gonorrhœa had been applied; but, no chancre ever ensued from it.

Mr. B. Bell also acquaints us, that two young gentlemen, while prosecuting the study of medicine, became anxious to ascertain the point in question; with which view, they resolved on making the following experiments, at a time, when neither of them had ever laboured under either gonorrhœa, or syphilis, and both in these and in the preceding experiments, the matter of infection was taken from patients who had never made use of mercury.

A small dossil of lint, soaked in the matter of gonorrhœa, was by each of them inserted between the prepuce and the glans, and allowed to remain on the same spot for the space of twenty-four hours. From this, they expected, that chancres would be produced; but, in the one, a very severe degree of inflammation ensued over the whole glans and præputium, giving all the appearance of, what is usually termed, *gonorrhœa spuria*. A considerable quantity of fetid matter was discharged from the surface of the inflamed parts, and, for several days, there was reason to fear, that an operation would be necessary for the removal of a paraphymosis. By the use of saturnine poultices, laxatives, and low diet, however, the inflammation abated, the discharge ceased, no chancre took place, and the case got entirely well.

The other gentleman, says Mr. B. Bell, was not so fortunate. The external inflammation, indeed, was slight, but, by the matter finding access to the urethra, he was attacked on the second day with a severe degree of gonorrhœa, which continued for a considerable time to give him a great deal of distress, nor did he, for upwards of a year, get entirely free from it.

The latter gentleman impressed with a sense of the imprudence and hazard of all such experiments, could not be prevailed upon to carry them further, although they were prosecuted by his friend. This young man, soon after the inflammation, arising from his first experiment, had been removed, inserted the matter of gonorrhœa on the point of a lancet, beneath the skin of the præputium, and, likewise, into the substance of the glans; but, although this was repeated three different times no chancres ensued. A slight degree of inflammation was excited: but it soon disappeared, without any thing being done for it. His last experiment was attended with more serious consequences. The matter of a chancre was inserted on the point of a probe to the depth of a quarter of an inch, or more, in the urethra. No symptoms of gonorrhœa ensued; but, in the course of five, or six days, a painful inflammatory chancre was perceived on the spot, to which the matter was applied. To this succeeded a bubo, which ended in suppuration, notwithstanding the immediate application of mercury; and the sore, that was produced, proved both painful and tedious. Ulcers were at last perceived in the throat, nor was a cure obtained, till a very large quantity of mercury had been given and the patient kept in close confinement for thirteen weeks. (*Treatise on Gonorrhœa Virulenta and Lues Venerea, Vol.* 1, *Edit.* 2, *p.* 438, *&c.*)

Some have supposed that the poisonous quality of venereal matter arises from a fermentation taking place in it as soon as it is formed. However, Mr. Hunter conceives, that the animal body has a power of producing matter according to the irritation given; and that the living powers, whenever irritated in a particular manner, produce such an action in the parts, as to generate a matter, similar in quality to that which excited the action.

It does not seem necessary to adduce the arguments, by which the idea of fermentation being concerned in the production of the venereal virus, might be refuted, as no modern practitioner now defends the doctrine. Mr. Hunter was of opinion, that the effects, produced by the venereal poison, arise from its peculiar, or specific irritation, joined with the aptness of the living principle to be irritated by such a cause, and the parts, so irritated acting accordingly. Hence, he considered, that the venereal virus irritated the living parts in a manner peculiar to itself, and produced an inflammation, peculiar to that irritation, from which a matter is produced, peculiar to the inflammation.

The venereal poison is capable of affecting the human body in two different ways: locally, that is, in those parts only, to which it is first applied; and, constitutionally, that is, in consequence of the absorption of the venereal pus, which affects parts, while it is diffused in the circulation.

Though Mr. Hunter uses the term constitutional, he explains in a note, that the word is not altogether correctly applied, as every complaint of a venereal nature is truly local, and produced by the simple application of the poison to the parts. The latter circumstance may happen, either by the immediate contact of the matter with the skin, before any absorption has taken place, or it may happen by the matter coming into contact with such parts as are susceptible of the venereal disease, after absorption has taken place, and while the virus is circulating in the system.

Mr. Hunter believed, as the reader already understands, that gonorrhœa was only one form of the venereal disease. In gonorrhœa, he observes, there is a formation of matter without a breach in the solids, while, on the contrary, a chancre is attended with a breach of this kind; and, he imputed the two different ways, in which the disorder appears, not to any thing peculiar in the kind of poison applied, but, to the difference in the parts contaminated. When the poison was applied to a secreting surface, which had no cuticle, he believed, that, it never produced ulceration, but, only an alteration in the quality of the secretion. Thus, in the urethra, instead of mucus, pus became secreted, and a gonorrhœa arose. On the other hand, Mr. Hunter thought, that, when the virus was applied to a surface, that is covered with a common cuticle, as the common skin of the body, ulceration would be the effect. In this manner, he accounts for the same poison producing two such different consequences, as gonorrhœa, and chancre.

### OF CHANCRES.

From the account, already delivered, that the venereal disease can only be imparted from one person to another by the actual contact of the matter, it must be obvious, that the first effects of the disorder must in general make their appearance on the parts of generation, in consequence of the virus being applied to them during coition.

Mr. Hunter reminds us, however, that the penis, which in men, is the common seat of a chancre, is, like every other part of the body, liable to diseases of the ulcerative kind, and that, on account of some circumstances, it is rather more so than other parts. When attention is not paid to cleanliness, excoriations, or superficial ulcers often originate in consequence of such neglect. The genitals, also, like almost every other part that has been injured, when once they have suffered from the venereal disease, are very liable to ulcerate again. Since, therefore, the penis is not exempted from the common diseases of the body, Mr. Hunter very properly remarks, that an opinion concerning ulcers situated on it, must be formed with great attention, particularly, as every disease in this part is suspected to be venereal.

"Venereal ulcers (says Mr. Hunter) commonly have one character, which, however, is not entirely peculiar to them; for, many sores, that have no disposition to heal, (which is the case with a chancre) have so far the same character. A chancre has commonly a thickened base, and, although, in some, the common inflammation spreads much further, yet the specific is confined to this base." (*P.* 215.)

Mr. Hunter notices, that there are three ways, in which chancres may be produced; first, by the poison being inserted into a wound; secondly, by being applied to a non-secreting surface; and, thirdly, by being applied to a common sore. To whichever of these three different surfaces it is applied, the pus produces its specific inflammation and ulceration, attended with a secretion of pus. The matter produced, in consequence of these different modes of application, partakes of the same nature as the matter, which was applied, because, as Mr. Hunter observes, the irritations are alike.

Mr. Hunter takes notice, that the poison much more readily contaminates, when it is applied to a fresh wound, than to an ulcer.

Though chancres commonly occur on the parts of generation, this circumstance is entirely owing to these being the only parts, with which the virus ever comes into contact, the application being made during the connexion between the sexes. Every part of the body may be affected by the application of venereal matter to it, particularly when the cuticle is thin. Mr. Hunter mentions, his having seen on the red part of the lip a chancre, which was as broad as a sixpence. The venereal virus had most probably been inadvertently applied to the part by the patient's own fingers. Mr. Hunter had not the least doubt of the sore being really a chancre; for, besides its diseased appearance, it was attended with a bubo in one of the glands under the lower jaw.

Chancres have frequently been seen on the fingers, particularly when there has been any previous cut, or scratch on these parts, and they have been employed in this state in dressing venereal sores.

Mr. Hunter computed, that claps occur more frequently, than chancres, in the proportion of four or five to one. As this celebrated writer conceived, that both these diseases originated from the same virus, which only produced different effects by its having to act on a secreting, or non-secreting surface, he attempts to explain the less frequent occurrence of chancres by the operation of the venereal poison, being often prevented by the intervention of the cuticle.

The same author states, that, in men, chancres generally make their appearance on the frænum, glans penis, prepuce, or on the common skin of the body of the penis; and, sometimes, on the fore part of the scrotum; but, he thought, that such sores took place most frequently on the frænum, and in the angle, between the penis and glans. He refers the cause of the venereal poison affecting these parts to the manner, in which the disease is caught, and not to any specific tendency in these parts to catch the complaint; and he imputes the circumstance of the frænum being more frequently affected, than other parts of the penis, to the external form of that part being irregular, and allowing the venereal matter to lie undisturbed in its folds. Thus the virus has time to irritate, and inflame the parts, and to produce the suppurative and ulcerative inflammation in them.

Mr. Hunter next observes, that the interval, between the application of the poison, and its effects upon the parts, is uncertain; but, that, on the whole, a chancre is longer in appearing, than a gonorrhœa. However, the nature of the parts affected makes some difference. When a chancre occurs on the frænum, or at the termination of the prepuce, in the glans, the disease in general comes on earlier; these parts being more easily affected, than either the glans penis, common skin of this organ, or the scrotum.

Mr. Hunter adds, that, in some cases, in which both the glans and prepuce were contaminated from the same application of the poison, the chancre made its appearance earlier on the latter part.

Mr. Hunter states his having been acquainted with some instances, in which chancres appeared twenty-four hours after the application of the matter; and with others, in which an interval of seven weeks, and even two months elapsed, between the time of contamination and that, when the chancre commenced.

A chancre first begins with an itching in the part. When the inflammation is on the glans penis, a small pimple full of matter, generally arises, without much hardness, or seeming inflammation, and with very little tumefaction; for, the glans penis is not so apt to swell, in consequence of inflammation, as many other parts are, especially, the prepuce. Mr. Hunter also explains, that chancres, situated on the glans, are not attended with so much pain and inconvenience, as sores of this nature on the prepuce. When chancres occur on the frænum, or, particularly, on the prepuce, a much more considerable degree of inflammation soon follows, attended with effects, more extensive and visible. These latter parts, being composed of very loose cellular membrane, afford a ready passage for the extravasated fluids. The itching is gradually converted into pain; in some cases, the surface of the prepuce is excoriated, and afterwards ulcerates; while, in other examples, a small pimple or abscess appears, as on the glans, and then turns into an ulcer. The parts become affected with a thickening, which, at first, while of the true venereal kind, is very circumscribed; not diffusing itself, as Mr. Hunter observes, gradually and imperceptibly into the surrounding parts; but, terminating rather abruptly. Its base is hard, and the edges a little prominent. When it begins on the frænum, or, near it, that part is very commonly wholly destroyed, or a hole is often made through it by ulceration. Mr. Hunter thought it better, in general, under the latter circumstance, to divide the part at once.

When the venereal matter is applied to the body of the penis, or front of the scrotum, where the cuticle is thicker, than that of the glans penis and prepuce, the chancre generally makes its appearance in the form of a pimple, which commonly forms a scab, in consequence of evaporation. The first scab is generally rubbed off; after which a second, still larger, one is produced.

When the disease is more advanced, it is often attended with such inflammation as is peculiar to the habit, becoming in many instances more diffused, and often producing phymosis, and paraphymosis. However, says Mr. Hunter, there is yet a hardness around the sores, which is peculiar to such as are caused by the venereal virus, particularly those on the prepuce.

The local, or immediate effects of the venereal disease are seldom wholly specific; but, are usually attended both with the specific and constitutional inflammation. Hence, Mr. Hunter, advises particular attention to be paid to the manner, in which a chancre first appears, and to its progress. If the inflammation spreads in a quick and considerable way, the constitution must be more disposed to inflammation, than is natural. When the pain is severe, Mr. Hunter remarks, there is a strong disposition to irritation. Chancres also, sometimes, soon begin to slough, there being a strong tendency to mortification.

It is also observed by Mr. Hunter, that when there is a considerable loss of substance, either from sloughing or ulceration, a profuse bleeding is no uncommon circumstance, more especially, when the ulcer is on the glans. The adhesive inflammation does not appear to take place sufficiently to unite the veins of this part of the penis, so as to prevent their cavity from being exposed, and the blood escapes from the corpus spongiosum urethræ. The ulcers, or sloughs, often extend as deeply as the corpus cavernosum penis, and similar bleedings are the consequence.

With respect to chancres in women, the labia and nymphæ, like the glans penis in men, are subject to ulceration, and the ulcerations are generally more numerous in females, than males, in consequence of the surface, on which the sores are liable to form, being much larger. As Mr. Hunter observes, chancres are occasionally situated on the edge of the labia; sometimes on the outside of these parts; and even on the perinæum. When the sores are formed on the inside of the labia or nymphæ, they can never dry, or scab; but, when they are externally situated, the matter may dry on them, and produce a scab, just as happens, with respect to chancres situated on the scrotum, or body of the penis.

Mr. Hunter remarks, that the venereal matter from these sores is very apt to run down the perineum to the anus, and excoriate the parts, especially, about the anus, where the skin is thin, and where chancres are liable to be thus occasioned.

Chancres have been noticed in the vagina; but, Mr. Hunter suspected, that they were not original ones; but, that they had spread to this situation from the inside of the labia.

Before any of the virus has been taken up by the absorbents, and conveyed into the circulation, a chancre is entirely a local affection.

## TREATMENT OF CHANCRES.

It was one of Mr. Hunter's opinions, that the ulceration, arising from venereal inflammation, generally, if not always, continues, till cured by art, and his theoretical reason for this circumstance was, that, as the inflammation in the chancre spreads, it is always attacking new ground, so as to produce a succession of irritations, and hinder the disease from curing itself.

It was no doubt the foregoing opinion of Mr. Hunter, which formed the authority for the position, which was always strenuously insisted upon in the surgical lectures, which I some years ago attended in London, viz. that all venereal complaints, when not counteracted by remedies, invariably grow progressively and regularly worse and worse. But, modern experience now apprises us, that this doctrine is far from being correct. The paper of Mr. Fergusson has already assured us, that in Portugal, the disease in its primary state amongst the natives is curable without mercury, and by simple topical treatment; that the antisyphilitic woods, combined with sudorifics, are an adequate remedy for constitutional symptoms; and that the virulence of the disease has there been so much mitigated, that, after running a certain course (commonly a mild one) through the respective orders of parts, according to the known laws of its progress, *it exhausts itself, and ceases spontaneously.* (See *Medical and Chir. Trans. Vol.* 4, *p.* 2—5.) In the last edition of the *First Lines of the Practice of Surgery*, it was sufficiently proved, from several conclusions drawn from the writings of Mr. Pearson, (*Obs. on the Effects of Various Articles in the Cure of Lues Venerea,*) that venereal sores could be benefited, and even healed, under the use of several inert insignificant medicines. Such was the state of our knowledge, when some well informed surgeons in this country determined to try here what would be the result of omitting mercury altogether, and trusting to simple topical dressings and cleanliness. Mr. Rose, one of the surgeons of the guards, has in particular prosecuted this interesting enquiry to an extent, which leaves no doubt of the fact, that both primary and secondary venereal sores will generally heal of themselves, not only without the assistance of mercury, but without that of any other means, excepting cleanliness and ordinary dressings. It is acknowledged, however, that, in this way the cure is more slowly effected.

I am also informed, that buboes, eruptions, and sore throats do occur, under this plan of treatment, with about as much frequency as when mercury is used; but, that these consequences also after a time, (sometimes, it is true, a considerable time) do spontaneously get well.

With respect to nodes, it is said, they hardly ever follow, when the disease is thus left to itself, which, if positively a fact, leaves no doubt in my own mind, that many nodes are actually induced by the immoderate use of mercury in the primary stages of syphilis; that is to say, the system is so impaired by the long and excessive exhibition of this mineral, that, when the patient discontinues it, and exposes himself to the damp and cold, his bones begin to suffer.

Although the above facts serve to correct the mistaken notion, that chancres always get worse and worse, without the aid of medicine, they do not altogether justify the entire discontinuance of the employment of mercury, because, it is admitted, that, if this medicine be not given, the cure is much slower, and sometimes very tedious. These important facts, however, have a strong tendency to prove, that, even in this country, mercury should never be given in any syphilitic cases, except in small moderate quantities, and that the practice of producing violent salivations ought to be for ever exploded.

When I was an apprentice at St. Bartholomew's Hospital, most of the venereal patients in that establishment were seen with their ulcerated tongues hanging out of their mouths; their faces prodigiously swelled; and their saliva flowing out in streams. The wards were not sufficiently ventilated, and the stench was so great, that the places well deserved the appellation of *foul*. Yet, notwithstanding mercury was thus *pushed*, (as the phrase was) it was then common to see many patients suffer the most dreadful of mutilations, in consequence of sloughing ulcers of the penis; other patients, whose noses and palates were lost; others, who were covered with nodes and dreadful phagedenic sores.

Happily, at the present day, this attachment to violent salivations no longer prevails; simple excoriations and common ulcers are more attentively discriminated from truly venereal sores; and even in decidedly syphilitic cases, mercury is seldom given except in very moderate doses, or such quantities as only gently affect the gums and salivary glands. The surgeons being now no longer blinded with the continual fears of syphilis, avoid the very mode of practice, which was itself the cause of all the aggravated forms of the disease. The consequence is that very bad instances of its ravages are now hardly ever observed there, and the few aggravated cases, which are met with, are generally in that state previously to their admission.

Having introduced these general remarks as a caution to surgeons to beware of the baneful plan of loading patients with mercury, I consider the reader better prepared to judge of the goodness of many of the subsequent observations and opinions, delivered by Mr. Hunter. The greater present mildness of syphilitic diseases in England, I ascribe chiefly to the more judicious treatment now adopted, and not to any change, or modification, in the nature of the disorder. There are others, however, who may think as Mr. Fergusson does with regard to syphilis in Portugal, that the disease has exhausted a great deal of its virulence from long continuance amongst us. But, before we are altogether justified in drawing such a conclusion, we must forget all the bad practice, which prevailed in former days, and which in my opinion is sufficient to account for the more severe forms, in which syphilis then presented itself.

We have already noticed, that chancres are not wholly venereal, but are attended with effects, dependent on constitutional peculiarities, to which the variety in the treatment must be adapted. The venereal symptoms, abstractedly considered, may be cured by mercury; but, the treatment of the symptoms, which depend on peculiarity of constitution, have no specific remedy, and demand different means in different cases.

Though the treatment of a chancre may be attempted both constitutionally and locally, it is commonly a considerable time before the sores appear to be affected by mercury. Sometimes the constitution must be under the influence of mercury for three or four weeks, or even longer, before a chancre begins to separate its discharge from its surface, so as to look red, and exhibit a living surface; but, says Mr. Hunter, when once it does change, its progress towards healing is more rapid. This author describes a chancre as being generally much longer in getting well, than the other local effects of the venereal disease, arising from the absorption of the poison into the constitution.

Chancres (observes the same celebrated writer) admit of two modes of treatment. The object of one is to destroy or remove them by means of escharotics, or by extirpation. That of the other is to overcome the venereal irritation by means of the specific remedy for the syphilitic poison.

That chancres are local complaints, is confirmed by the circumstance of their admitting of being destroyed, or cured merely by local treatment. It has been a question, whether mercury should ever be locally applied to chancres or not. On this subject, Mr. Hunter considers, that, in the cure of such sores, there are two objects to be aimed at; one is the cure of the chancre itself; the other is the prevention of a contamination of the habit.

The cure of the chancre is to be effected by mercury, applied either in external dressings, or, internally, through the circulation, or in both ways. The preservation of the constitution from contamination is to be accomplished, first by shortening the duration of the chancre, which shortens the opportunity for absorption; and secondly, by internal medicine, which must be in proportion to the time, that the absorption may have been going on.

If, says Mr. Hunter, the power of a chancre to contaminate the constitution, or, what is the same thing, if the quantity of the virus absorbed is proportioned to the size of the chancre, and the time of absorption, which most probably it is, then whatever shortens the time, must diminish the above power, or the quantity of the poison absorbed. Also, if the quantity of mercury, necessary to preserve the constitution, is proportioned to the quantity of the virus absorbed, then whatever lessens the quantity absorbed, must proportionally preserve the constitution. For instance, says Mr. Hunter, if the power of a chancre to contaminate the constitution in four weeks is equal to four, and the quantity of mercury necessary to be given internally, both for the cure of the chancre and the preservation of the constitution, is also equal to four, then whatever shortens the duration of the chancre, must lessen in the same proportion the quantity of mercury necessary. Hence, if local applications, together with the internal use of mercury, will cure a chancre in three weeks, then it will only be necessary to exhibit three-fourths of the quantity of mercury internally. Mr. Hunter observes, therefore, that local applications, inasmuch as they tend to shorten the duration of a chancre, shorten the duration of absorption, and, in this manner, shorten the necessity for the continuance of an internal course of mercury, all in the same proportion. For example, if four ounces of mercurial ointment will cure a chancre and preserve the constitution in four weeks, three ounces will be sufficient to preserve the constitution, if the cure of the chancre can be, by any other means, forwarded, so as to be effected in three weeks. Mr. Hunter affirms, that this is not speculation; but, the result of experience, and confirmed by the destruction of chancres.

### DESTROYING CHANCRES.

Mr. Hunter notices, that the most simple method of treating a chancre is to destroy, or extirpate it, whereby it is reduced to the state of a common sore, or wound, and heals up as such. This can only be done on the first appearance of the chancre, when the surrounding parts are not yet contaminated; for, it is absolutely necessary to remove the whole of the diseased part, and this object is exceedingly difficult of accomplishment, when the disease has spread considerably. The plan may be effected either with the knife, or caustic. Mr. Hunter states, that, when the chancre is situated on the glans penis, touching the sore with the lunar caustic is preferable to cutting it away, because the hemorrhage from the cells of the glans would be considerable in the latter method.

The caustic will not give a great deal of pain, as the glans is not an exceedingly sensible part. The caustic employed should be pointed at the end, like a pencil, in order that it may only touch such parts as are really diseased. This treatment should be continued, till the surface of the sore looks red and healthy, after the separation of the last sloughs. When it has attained this condition, it will heal, like any other sore, made with caustic.

When the sore is on the prepuce, or the common skin of the penis, and, in an incipient state, the same practice may be adopted with success. When the chancre is large, however, it cannot be destroyed with the argentum nitratum, which does not extirpate the increasing sore deeply enough. In such cases, Mr. Hunter thought, that the potassa cum calce would answer very well. When the latter caustic cannot be conveniently employed, this author recommended the chancre to be cut away. He mentions his having taken out such a sore by dissection, and that the part afterwards healed with common dressings. However, says he, as our knowledge of the extent of the disease is not always certain; and as this uncertainty increases with the size of the chancre, the cure must be in some measure promoted by proper dressings, and, it will be prudent to dress the sore with mercurial ointment. When this plan is followed, Mr. Hunter believed, that there is but little danger of the constitution being infected, particularly, when the chancre has been destroyed almost immediately on its first appearance; for, then it is reasonable to conclude, that there has not been time for absorption to have taken place. But, observes the same author, as it must be in most cases uncertain, whether there has been absorption or not, this practice should not always be trusted to, and, perhaps, never should be relied in. Hence, even when the chancre has been destroyed in its incipient state, some mercury should be given from motives of prudence, the quantity of which medicine ought to be proportioned to the duration and progress of the sore. When the chancre is large, before it is extirpated, mercury is absolutely necessary, and Mr. Hunter conceived, that very little good is done by the extirpation.

### LOCAL APPLICATIONS TO CHANCRES.

The cure of a chancre (says Mr. Hunter) is a different thing from its extirpation, and consists in destroying its venereal disposition, which object being effected, the parts heal of course, as far as they are venereal.

The employment of mercury, both as a topical application, and a constitutional remedy, is the best method of curing a chancre.

Mercurial ointments have been commonly used as dressings to chancres; but, Mr. Hunter was of opinion, that if the mercury were joined with watery substances, instead of oily ones, the application, by mixing with the matter, would be continued longer to the sore, and would prove more effectual. This, he observes, is one advantage, which poultices have over common dressings. He has often used mercury rubbed down with some conserve, instead of ointment, and it answered extremely well. Calomel used in the same way, and also the other preparations of mercury, mixed with mucilage, or honey, answer the same purpose. Such dressings, according to Mr. Hunter, will effect a cure, in cases, which are truly venereal, and free from other morbid tendencies.

Some chancres are indolent, and require a little warm balsam or red precipitate to be joined with the mercurial dressing. Mr. Hunter says, that calomel mixed with salve is more active, than common mercurial ointment, and is attended with better effects, when the case requires stimulants.

Solutions of the sulphate of copper, acetite of copper, submuriate of mercury, &c. have been recommended. But, Mr. Hunter very judiciously observes, that, as all these applications are only of service in remedying any peculiar disposition of the parts, as they have no specific power over the venereal poison, and as such dispositions are innumerable, it is almost impossible to say, what applications will be effectual in every instance. Some kinds of dressings will answer in one state of the sore; some in another. The parts affected are often found extremely irritable, in which circumstance the mercury should be mixed with opium or preparations of lead.

Mr. Hunter was an advocate for changing the dressings, very often, because the matter separates them from the sore, so as to diminish their effects. He states, that changing the applications, thrice a day, will not be found too often, particularly, when they are in the form of an ointment.

When the venereal nature of a chancre is removed, the sore frequently becomes stationary, in which case Mr. Hunter observes, that new dispositions have been acquired, and the quantity of disease in the part has been increased. When chancres are only stationary, Mr. Hunter says, they may often be cured, by touching them slightly with the lunar caustic. No cicatrization, in this case, seems possible, till the contaminated surface, or the new flesh, which grows on that surface, has either been destroyed or altered.

It is often surprising, how quickly the sores heal up after being touched with the application. (See *Hunter on the Venereal Disease.*)

### INTERNAL EXHIBITION OF MERCURY FOR CHANCRES.

At the same time that topical applications are made to chancres, mercury must be internally exhibited, both with a view of curing these ulcers, and preventing a lues venerea. Mr. Hunter believed, that the venereal disposition of the chancre would hardly ever withstand both local and internal mercurials.

When local applications cannot easily be made to chancres, as in cases of phymosis, there still is a greater necessity for giving mercury internally, by which means, the cure may in the end be effected.

Mercury should always be given internally in every case of chancre, let it be ever so slight, and even when the sore has been destroyed on its very first appearance. The remedy should always be exhibited the whole time of the cure, and continued for some time after the chancre has healed; for, says Mr. Hunter, as there are, perhaps, few chancres without absorption of the matter, it becomes absolutely necessary to give mercury to act internally, in order to hinder the venereal disposition from forming. How much mercury should be thrown into the constitution in the cure of a chancre, with a view of keeping the system from being affected, cannot easily be determined, as there is no disease actually formed, by which we can be guided. Mr. Hunter states, that the quantity must in general be proportioned to the size, number, and duration, of the chancres; or, in other words, proportioned to the opportunity, which there has been given for absorption. From the facts, however, which we have already premised in this article, it is never advantageous to give mercury in such quantities, as will produce a violent salivation. Modern experience proves, that, in almost every instance, small doses will effect a cure more safely, than large immoderate quantities.

The mercury, which is exhibited to act internally, may be conveyed into the system, either by the skin, or stomach, according to circumstances, and, it should be so taken, as to produce a slight affection of the mouth.

Mr. Hunter next remarks, that when the sore has put on an healthy look, when the hard basis has become soft, and the ulcer has skinned over in a favourable manner, it may be regarded as cured.

The same distinguished writer notices, however, that, in very large chancres, it may not always be necessary to continue either the external or internal administration of mercury, till the sore is healed; for, the venereal action is just as soon destroyed in a large chancre, as it is in a small one, since every part of the sore is equally affected, by the medicine, and, of course, cured with equal expedition. But, in regard to cicatrization, circumstances are different, because a large sore is longer than a small one, in becoming covered with skin. Hence, Mr. Hunter very justly explains, that a large chancre may be deprived of its venereal action, long before it has healed; while, on the other hand, a small one may heal before the syphilitic affection has been destroyed. In the latter case, this gentleman represents it as most prudent, both on account of the chancre and constitution, to continue the employment of mercury a little while after the sore is healed.

Mr. Hunter, in the valuable work, which he has left on the present subject, takes notice of sloughs, which occur in the tonsils, from the effect of mercury on the throat, and are apt to be mistaken for venereal complaints. He also mentions, that, sometimes, when the original chancre has been doing well, and been nearly healed, he has seen new sores break out on the prepuce, near the first, and assume all the appearance of chancres.

When, in the treatment of chancres, a bubo arises, while the constitution is under the influence of a sufficient quantity of mercury to cure such sores, which medicine has also been rubbed into the lower extremity, on the same side as the bubo, Mr. Hunter suspects, that the swelling in the groin is not venereal, but is produced by the mercury. In these cases he always preferred conveying mercury into the system in some other manner.

With respect to the treatment of chancres in women, since it is difficult to keep dressings on the parts, Mr Hunter advises the sores to be frequently washed with some mercurial solution, and, speaks of one, made with oxymuriate of mercury, as perhaps being the best, since it will act as a specific, and stimulant also, when this is requisite. When the chancres, however, are irritable, they are to be treated in the same manner, as similar complaints in men. When the sores extend into the vagina, this passage must be kept from becoming constricted, or closed, by the introduction of lint.

Sometimes, after a chancre and all venereal disease are cured, the prepuce continues thickened and elongated, so that the glans cannot be uncovered. Perhaps, the case is often without remedy. Mr Hunter, however, very properly recommends trying every possible means, and he informs us, that the steam of warm water, hemlock fomentations, and cinnabar fumigations, are frequently of singular service.

When the thickening and enlargement of the prepuce cannot be removed by applications, all the portion, anterior to the glans penis, may be cut away. (See *Phymosis.*)

Mr Hunter has very ably explained, that chancres, both in men and women, often acquire, during the treatment, new dispositions, which are of various kinds, some retarding the cure, and leaving the parts in an indolent thickened state, after the cure is accomplished. In other instances, a new disposition arises, which utterly prevents the parts from healing, and often produces a much worse disease, than that, from which it originated. Such new dispositions may lead to the growth of tumours. They are more frequent in men, than women, and generally occur only when the inflammation has been violent from some peculiarity of the parts, or constitution. They have sometimes been considered as cancerous.

Among the diseases in question, Mr. Hunter notices those continued, and often increased inflammations, suppurations, and ulcerations, which become diffused through the whole prepuce, and, also, along the common skin of the penis, which becomes of a purple hue, attended with such a general thickening of the cellular membrane, as makes the whole organ appear considerably enlarged. The same writer observes, that the ulceration on the inside of the prepuce will sometimes increase, and run between the skin and the body of the penis, and eat holes through in different places, till the whole is reduced to a number of ragged sores. The glans often share the same fate, till more, or less of it is gone. Frequently, the urethra in this situation is wholly destroyed by ulceration, and the urine is discharged some way farther back. The ulceration, if unchecked, at length destroys all the parts. In this acute case, prompt relief is demanded; but, often the proper mode of treatment cannot be at once determined, owing to our ignorance, in respect to the exact nature of the peculiar cause of the disease. Mr. Hunter states, that the decoction of sarsaparilla is often of service, when given in large quantities, and that he has known the German diet drink effect a cure, after every other remedy had failed. The following diet drinks, he says, have been much recommended.

Take of crude antimony and pumice-stone, pulverized, and tied up in a bit of rag, of each one ounce; China root, sliced, sarsaparilla root, sliced and bruised, of each half an ounce; ten walnuts with their rinds bruised; spring-water, four pints; boiled to half that quantity; filter it, and let it be drunk daily in divided doses.

Take of sarsaparilla, Saunders-wood, white and red, of each three ounces; liquorice and mezereon, of each half an ounce; of lignum rhodium, guaiacum, sassafras, of each an ounce; crude antimony, two ounces; mix them and infuse them in boiling water, ten pints, for twenty-four hours; and, afterwards boil them to five pints, of which let the dose be from a pint and a half to four pints a day.

Mr. Hunter also states, that the extract of hemlock is sometimes of service, and that he has known sea-bathing effect a perfect cure.

Sometimes, when such sores are healing, it becomes necessary to keep the orifice of the urethra from closing, by the introduction of a bougie.

Sometimes, after a chancre has healed, the cicatrix breaks out again, and puts on the appearances of the preceding sore. Occasionally, similar diseases break out in different places from that of the cicatrix. Mr. Hunter represents, that they differ from a chancre in generally not spreading so fast, nor so far; in not being so painful, nor so much inflamed; in not having such hard bases, as venereal sores have; and in not producing buboes. This writer was of opinion, that they were not venereal. They are very apt to recur.

Mr. Hunter does not specify any particular mode of cure for all these cases; but, he mentions one instance, which seemed to be cured by giving forty drops of the lixivium saponarium, every evening and morning, in a basin of broth; and he adverts to another case, which was permanently cured by sea-bathing.

In some instances, after a chancre has healed, the parts, as Mr. Hunter remarks, do not ulcerate; but, appear to become thickened, and indurated. Both the glans and prepuce seem to swell, so as to form on the end of the penis a tumour, or excrescence, shaped very much like a cauliflower, and, when cut into, shewing radii, running from its base, or origin, towards the external surface. It is extremely indolent. It is not always a consequence of the venereal disease; for, Mr. Hunter has seen it arise spontaneously.

No medicine seems to be at all likely to cure the disease: the only successful means is to amputate a considerable part of the penis, and then to keep a proper catheter introduced into the urethra.

### WARTS.

Another disposition, induced by the previous occurrence of chancres, is a disposition to form excrescences, or cutaneous tumours, called warts. These are considered by many not simply as a consequence of the venereal poison; but, as possessed of its specific disposition, and, therefore, says Mr. Hunter, they have recourse to mercury for the cure of them; and, it is said, that such treatment often removes them. This eminent practitioner never saw mercury produce this effect, although the medicine was given in sufficient quantity to cure recent chancres, and a lues venerea, in the same person.

Mr. Hunter observes, that as these substances are excrescences from the body, they are not to be considered as truly a part of the animal, not being endowed with the common, or natural animal powers. Many trifling circumstances make them decay. An inflammation of the sound parts round the wart, or stimuli applied to its surface, will often make it die. Electricity will also induce an action in such excrescences, which they are not able to support; an inflammation is excited round them, and they drop off.

From this account, we must perceive, according to Mr. Hunter, that the knife and escharotics are not always necessary, although, these modes will act more quickly, than any other, especially, when the neck of the wart is small. When such is the form of the excrescence, perhaps, a pair of scissars is the best instrument; but, says the above distinguished writer, when cutting instruments of any kind are horrible to the patient, a silk-thread, tied round the neck of the wart, will do very well. However, whichever plan is adopted, it is in general necessary to touch with caustic the base of the little tumour, after this has separated.

Mr. Hunter remarks, that escharotics act upon warts in two different ways, namely, by deadening a part, and stimulating the remainder, so that, by the application of escharotic, after escharotic, the whole excrescence decays moderately fast; and it is seldom necessary to destroy it down to the very root, which is often thrown off. This, however, is not always the case, and the wart grows again, in which circumstance, it is proper to let the caustic destroy even the root itself.

The potassa cum calce, nitrate of silver, and sulphate of copper, are all proper applications. But, one of the best stimulants is the ærugo æris and powder of savin leaves, mixed together. (*Hunter on the Venereal Disease.*)

## BUBOES.

The immediate consequence of a chancre, which is called a bubo, and also the remote effects, implied by the term, *lues venerea,* arise from the absorption of recent venereal matter from some surface, where it has either been applied or formed.

We are already aware, that Mr. Hunter believed the matter of gonorrhœa capable of communicating the venereal disease. Hence, he explains in the following terms, the three ways, in which he thought a bubo might arise in consequence of absorption. He observes, that the first and most simple manner, is when the matter, either of a gonorrhœa, or chancre, has only been applied to some sound surface, without having produced any local effect on the part; but, has been absorbed, immediately after its application. Mr. Hunter affirms, that he has seen instances of this kind, though he confesses they are very rare, and, that, in most cases apparently of this nature, a small chancre may be found to have existed.

The second mode of absorption, or that taking place in a gonorrhœa, Mr. Hunter represents as more frequent.

The third mode is the absorption of matter from an ulcer, which may either be a chancre, or a bubo. This mode is by far the most common, and it proves, with many other circumstances, that a sore, or ulcer, is the most favourable for absorption. Mr. Hunter believed, that absorption was more apt to take place from sores on the prepuce, than those on the glans, and he says, he had seen more buboes from chancres in the first situation.

A fourth mode of absorption from a wound is also an occasional occurrence.

Mr. Hunter notices, that, what is now commonly understood by a bubo, is a swelling, taking place in the absorbing system, especially in the glands, arising from the absorption of some poison, or other irritating matter. When such swellings take place in the groin, they are called buboes, whether they proceed from absorption, or not.

Mr. Hunter regards every abscess in the absorbing system as a bubo, whether in the vessels, or the glands, when the complaint originates from the absorption of venereal matter.

The matter is taken up by the absorbent vessels, and is conveyed by them into the circulation. In its passage through these vessels, it often affects them with the specific inflammation. The consequence is the formation of buboes, which are venereal abscesses. These are exactly similar to a chancre in their nature and effects, the only difference being in regard to size. As the lymphatic vessels and glands are irritated by the specific matter, before it has undergone any change in its passage, the inflammation produced, and the matter secreted, partake of the specific quality.

Inflammation of the absorbent vessels themselves is not nearly so frequent, as that of the glands. In men, such inflammations, in consequence of chancres upon the glans, or prepuce, generally appear, like a cord, leading along the back of the penis from the sores. Sometimes, the absorbents inflame, in consequence of the thickening and excoriation of the prepuce in gonorrhœa. The indurated lymphatics often terminate insensibly near the root of the penis, or near the pubes; while, in other instances, they extend further to a lymphatic gland in the groin. Mr. Hunter believed, that this affection of the absorbent vessels is truly venereal. The formation of a hard cord, the same author conceived, arose from a thickening of the coats of the absorbents, and from an extravasation of coagulable lymph on their inner surface.

A cord, of the above kind, often suppurates, sometimes in more places, than one, so as to form one, two, or three buboes, or small abscesses in the body of the penis.

Inflammation much more frequently affects the absorbent glands, than the vessels. The structure of the former parts appear to consist of the ramifications and reunion of the absorbent vessels. From this structure, observes Mr. Hunter, we may reasonably suppose, that the fluid absorbed is in some measure detained in these glands, and thus has a greater opportunity of communicating the disease to them, than to the distinct vessels.

Swellings of the absorbent glands may originate from other diseases, and such should be carefully discriminated from those which arise from the venereal poison. With this view, Mr. Hunter advises us first to enquire into the cause, in order to ascertain, whether there is any venereal complaint at some greater distance from the heart, such as chancres on the penis, or any preceding disease in this situation. He recommends us to enquire, whether any mercurial ointment has been at all applied to the leg and thigh on the diseased side; for, mercury applied to those parts for the cure of a chancre, will sometimes cause glandular enlargements, which are occasionally mistaken for venereal buboes. This irritation of the inguinal glands by the mechanical action of mercurial ointment, has been particularly noticed by Professor Assalini, who states, that he has had frequent opportunities of convincing himself of the fact. (See *Manuale di Chirurgia, p.* 67.) Mr. Hunter also reminds us to observe, whether there has been any preceding disease in the constitution, such as a cold, fever, &c. The quick, or slow, progress of the swelling, is likewise to be marked, and the tumour must be distinguished from femoral hernia, lumbar abscesses, and aneurisms of the crural artery.

Sometimes, the venereal matter does not produce its effects on the absorbent glands, for some time after absorption has taken place. In certain instances, Mr. Hunter notices, that, at least, six days have elapsed; a circumstance, which could only be known by the chancres having been healed six days before the bubo began to appear. However, Mr. Hunter infers, that the matter had been much longer absorbed, as the last matter of a chancre is probably not venereal.

Mr. Hunter next remarks, that the glands, nearest to the seat of absorption, are in general the only ones, which are attacked. Thus, when the matter has been taken up from the penis in men, the inguinal glands are affected; and, when from the vulva in women, those glands swell, which are situated between the labia and thigh, and the round ligaments.

It was one of Mr. Hunter's opinions, that only one gland at a time is commonly affected by the absorption of venereal matter. If this sentiment be correct, the circumstance may be considered as a kind of criterion between venereal and other buboes. The second order of lymphatic vessels and glands are never affected; as, for instance, those along the iliac vessels, or back. Mr. Hunter informs us, that he also observed, that, when the disease was contracted by a sore, or cut upon the finger, the bubo occurred a little above the bend of the arm, by the side of the biceps muscle, and no swelling of this sort formed in the arm-pit. However, he mentions his having heard of a few rare cases, in which a swelling in the axilla was also produced.

When buboes arise from a venereal disease on the penis, they are situated in the glands of the groin. When a bubo arises from a gonorrhœa, either groin may be attacked. But when the disease originates from a chancre, the bubo most frequently takes place in the nearest groin.

The situation of the absorbent glands, however, is not always exactly the same, and the course of the lymphatics therefore is subject to some variety. Hence, Mr. Hunter has seen a venereal bubo, produced by a chancre on the penis, situated a considerable way down the thigh; he has also often seen buboes as high as the lower part of the belly, before Poupart's ligament; and sometimes near the pubes.

### BUBOES IN WOMEN.

The seat of absorption is more extensive in the female sex, and the course of some of the absorbents is also different. Hence, buboes in women may occur in three situations, two of which are totally different from those in men.

When chancres are situated forwards, near the meatus urinarius, nymphæ, clitoris, labia, or mons veneris, the absorbed matter is generally conveyed along one, or both of the round ligaments, and the buboes are formed in those ligaments, just before they enter the abdomen. Mr. Hunter suspected such buboes not to be glandular ones; but, only inflamed absorbents.

When chancres are situated far back, near, or on the perinæum, the absorbed matter is carried forward along the angle, between the labium and the thigh, to the glands in the groin, and often, in this course, small buboes are formed in the absorbents, similar to those abscesses, which occur on the penis in men.

When the effects of the poison do not rest here, a bubo in the groin may be occasioned, in the same manner as in men.

It is more difficult to learn, whether a bubo is venereal in women, than men, owing to the frequent difficulty of ascertaining, that there is no infection present. In men, who have had no local complaint, the bubo can only be venereal, when direct absorption from the surface of the skin has taken place.

### MANNER IN WHICH BUBOES MAKE THEIR APPEARANCE, &c.

A bubo, says Mr. Hunter, commonly begins with a sense of pain, which leads the patient to examine the part, where a small hard tumour is to be felt. This increases, like every other inflammation, that has a tendency to suppuration, and, unless checked, pus forms, and ulceration follows, the matter making its way to the skin very fast.

The above celebrated writer remarks, however, that there are some cases, which are slow in their progress. This circumstance he imputes either to the inflammatory process being kept back by mercury, or other means, or to its being retarded by a scrophulous tendency.

The inflammation, he says, is at first confined to the gland, which may be moved about in the cellular membrane; but, when the part has become enlarged, or when the inflammation, and suppuration, are more advanced, the surrounding parts become more inflamed, and the tumour is more diffused. Some buboes become complicated with an erysipelatous and œdematous affection, by which means, they are rendered more diffused, and less disposed to suppurate.

Mr. Hunter allows, that to distinguish, with certainty, the true venereal bubo from swellings of the glands in the groin, may be very difficult. He represents the true venereal bubo, in consequence of a chancre, as being most commonly confined to one gland. It preserves its specific distance till suppuration has taken place, and then becomes more diffused. It is rapid in its progress from inflammation to suppuration and ulceration. The suppuration is commonly large, considering the size of the gland, and there is only one abscess. The pain is very acute, and the inflamed part of the skin is of a florid red colour.

Mr. Hunter describes such buboes, as arise without any visible cause, as being of two kinds. One sort inflame and suppurate briskly. These he always suspected to be venereal, although he allows, there was no proof of it, and only a presumption deduced from the quick progress of the disease.

The second kind are generally preceded, and attended with slight fever, or the common symptoms of a cold, and they are generally indolent and slow in their progress. If they are quicker, than ordinary, they become more diffused, than venereal buboes, and they are often not confined to one gland. When very slow, they give but little sensation; but, when quicker, the sensation is more acute, though not so much so as in venereal cases. They usually do not suppurate, and often become stationary. When they do suppurate, it is in a slow manner, and, frequently, in more glands, than one, while the inflammation is more diffused, and not considerable, in relation to the swelling. The matter makes its way to the skin slowly, and the part affected is of a more purple colour. Sometimes, the abscesses are very large, yet not painful.

In considering whether the swellings of the inguinal glands are, or are not venereal, the first thing to be attended to is, whether, or not, there are any venereal complaints. If there are none, Mr. Hunter observes, that there is a strong presumptive proof, that the swellings are not venereal. When the swelling is only in one gland, very slow in its progress, and gives but little, or no pain, it is probably merely scrophulous. However, when the swelling is considerable, diffused, and attended with some inflammation and pain, the constitution is most probably affected with slight fever, the symptoms of which are lassitude, loss of appetite, want of sleep, small quick pulse, and an appearance of approaching hectic. Such swellings are long in getting well, and do not seem to be affected by mercury, even when very early applied.

Mr. Hunter mentions his having seen the above affection of the groin, together with the constitutional indisposition, take place, where there were chancres; and he was puzzled to determine, whether the disease in the groin was sympathetic, from derangement of the constitution, or whether it arose from the absorption of matter. He had long suspected, that there was a mixed case, and was at last certain, that such a case might prevail. He says, he has seen instances, in which the venereal matter, like a cold, or fever, only irritated the glands to disease, producing in them scrophula, to which they were disposed.

In such cases, says Mr. Hunter, the swellings commonly arise slowly, give but little pain, and seem to be rather hastened in their progress, if mercury is given to destroy the venereal disposition. Some suppurate while under this resolving course; and others, which probably had a venereal taint at first, become so indolent, that mercury has no effect upon them, and, in the end, they either get well of themselves, or by other means.

According to Mr. Hunter, buboes are undoubtedly local complaints.

### TREATMENT OF BUBOES.

When a bubo is certainly a venereal one, and only in an inflamed state, an attempt is to be made to resolve the swelling. The propriety of the attempt, however, depends on the progress, which the disease has made. If the bubo be very large, and suppuration appears to be near at hand, resolution is not likely to be effected. When suppuration has already taken place, Mr. Hunter much doubted the probability of any success attending the endeavour, which now might possibly only retard the suppuration, and protract the cure.

The resolution of these inflammations, says Mr. Hunter, depends principally on mercury, and almost absolutely on the quantity, which can be made to pass through them. When suppuration has taken place, the cure also depends on the same circumstances.

The quantity of mercury, which can be made to pass through a bubo, is represented by Mr. Hunter, as depending principally on the quantity of external surface for absorption beyond the bubo.

The mercury is to be applied to such surfaces, as allow the remedy, when absorbed, to pass through the diseased gland. In this manner, the disease in the groin is subdued, and the constitution is less liable to be contaminated.

However, Mr. Hunter accurately notices, that the situation of many buboes is such, as not to have much surface for absorption beyond them; for instance, the buboes on the body of the penis, arising from chancres on the glans, or prepuce.

When the bubo is in the groin, Mr. Hunter recommends surgeons to pay attention to whether the swelling is in the upper part of the thigh and groin, on the lower part of the belly before Poupart's ligament, or near the pubes. When the buboes are situated on the body of the penis, the absorbents, leading directly from the seat of absorption, are themselves diseased. When the bubo is in the groin, and, at the upper part of the thigh, we may conclude, that the lymphatics, both from the penis and thigh, run to the affected gland. When the bubo is high up, or on the lower part of the belly, before Poupart's ligament, probably, the absorbents, which arise from about the groin, lower part of the belly and pubes, pass through the bubo. When the bubo is far forward, the absorbents of the penis and skin about the pubes, pass through the swelling. Mr. Hunter contends, that the knowledge of these circumstances is very necessary, in order to apply mercury in the most advantageous situations.

The utility of rubbing the mercury into surfaces, the absorbents of which lead through the bubo, must be obvious, when it is considered, that the medicine cannot pass to the common circulation, without going through the diseased parts; that it must promote the cure, as it passes through them; and that it also prevents the matter, which has already passed, and is still continuing to pass, into the constitution, from acting there. Thus the bubo is cured, and the constitution, at the same time, preserved.

Mercury alone, however, is not always capable of effecting the cure of buboes.

When the inflammation rises very high, bleeding, purging, and fomenting, are generally recommended. When the inflammation was erysipelatous, Mr. Hunter had a high opinion of bark; and, when it was scrophulous, he used to recommend hemlock, and poultices made with sea-water.

The same eminent writer also takes notice of the fact of emetics sometimes occasioning the absorption of buboes, even after they contain matter.

#### 1. *Resolution of the Inflammation of the Absorbents on the Penis.*

Though there is not surface enough beyond the bubo, for rubbing in a sufficient quantity of mercury, to prevent the effects of absorption, Mr. Hunter still advises this surface to be kept constantly covered with mercurial ointment. In consequence of the surface in question being so small, more mercury must also be conveyed into the system by the mouth, or frictions on some other part. Mr. Hunter observes, that this is necessary, both in order to prevent a lues venerea, and to cure the parts themselves. The quantity of mercury must be regulated by the appearances of the original complaint, and the readiness, with which the disease gives way. The same method, he adds, is to be followed in women, and the ointment should be kept continually applied to the inside and outside of the labia.

#### 2. *Resolution of Buboes in the Groin.*

The inflammation of the absorbent glands, is to be treated on the same principle as that of the vessels. In the first case, however, we are able to make a larger quantity of mercury pass through the diseased parts. When the bubo is in the groin, the mercurial ointment is to be rubbed on the thigh. This surface, as Mr.

Hunter remarks, will in general absorb as much mercury as will be sufficient to resolve the bubo, and preserve the constitution from being contaminated; but, when resolution does not readily take place, the same author advises us to increase the surface of friction, by rubbing the ointment upon the leg.

When the bubo is on the lower part of the belly, the ointment should be rubbed also on the penis, scrotum, and belly. The same plan should be followed when the bubo is still more forward.

Mr. Hunter states, that when the bubo gives way, the mercurial frictions must be continued, till it has entirely subsided, and, perhaps, longer, on account of the chancre, which may not yield so soon as the bubo. After the bubo has suppurated, Mr. Hunter is doubtful, whether rubbing in mercury is useful, or not.

### 3. *Resolution of Buboes in Women.*

When the swellings are situated between the labia and thigh, Mr. Hunter recommends the mercurial ointment to be rubbed in all about the anus and buttock, from which parts the absorbents probably run through the seat of the diseases. When the buboes are in the round ligaments, the surface for absorption will not be large enough, and more mercury must be internally given, or rubbed into other surfaces.

When the bubo is in one of the inguinal glands, the same plan is to be adopted, as in the same case in men.

### 4. *Buboes in unusual Situations.*

When buboes form in the arm, or armpit, in consequence of the absorption of venereal matter from wounds on the hands, or fingers, mercurial ointment should be rubbed on the arm and fore-arm. Mr. Hunter adds, however, that this surface may not be sufficient, so that it may be proper to convey more mercury into the system in other ways. He states, that he has seen a true venereal chancre on the middle of the lower lip, attended with a bubo, on each side of the neck, under the lower jaw, close to the maxillary gland. The swellings were resolved by applying mercurial ointment to them, and the chin, and lower lip.

### 5. *Quantity of Mercury necessary for the Resolution of a Bubo.*

Mr. Hunter observes, that the quantity of mercury, necessary for the resolution of a bubo, must be proportioned to the obstinacy of the complaint; but, that care must be taken not to extend the employment of the medicine so far as to produce certain effects on the constitution. When the bubo is in a situation, which admits of a large quantity of mercury being rubbed in, so as to pass through the swelling, and when the complaint readily yields to the use of half a drachm of mercurial ointment, every night, the mouth not becoming sore, or at most, only tender, the above author thinks it sufficient to pursue this course, till the gland is reduced to its natural size. In this manner, the constitution will probably be safe, provided the chancre, which may have caused the bubo, heals at the same time. When the mouth is not affected in six, or eight days, and the gland does not readily resolve, then two scruples, or a drachm, may be applied every night; and, continues Mr. Hunter, if there should still be no amendment, even more must be rubbed in. In short (says he) if the reduction is obstinate, the mercury must be pushed as far as can be done without a salivation.

When there is a bubo on each side, so much mercury cannot be made to pass through each, as the constitution in general will not bear this method. However, Mr. Hunter sanctions the plan of minding the soreness of the mouth less in this kind of case; though, he adds, that it is better to let the buboes proceed to suppuration, than to load the system with too much mercury.

When the situation of buboes will not allow an adequate quantity of absorbed mercury to pass through them, the frictions must be continued in order to affect the constitution; but, according to Mr. Hunter, more mercury in this case will be requisite, than when the remedy can be made to pass directly through the diseased gland.

Many buboes remain swollen, without either coming to resolution, or suppuration; and, notwithstanding every attempt to promote these changes, the glands become hard and scirrhous. Mr. Hunter conceived, that cases of this sort are either scrophulous at first, or become so as soon as the venereal disposition is removed. He advises the use of hemlock, sea-water, poultices, and sea-bathing.

According to a modern surgeon, at Milan, a gentleman of judgment and considerable experience, when buboes are in a chronic stationary state, the application of blisters to the swelling is attended with the most beneficial effects. And, he rightly observes, that, when such tumours are extremely hard and indolent, it is more advantageous to let the patient have the benefit of the open air, exercise, and his accustomed mode of living, than to confine him in an hospital. (*Assalini, in Manuale di Chirurgia, p.* 64; *Milano,* 1812.)

### 6. *Treatment of Buboes which suppurate.*

The suppuration of buboes frequently cannot be prevented by any known means. They are then to be treated, in some respects, like any other abscess. Before opening buboes, Mr. Hunter conceived it was advantageous to let the skin become as thin as possible, as a large opening would then become unnecessary, and no measures would be requisite for keeping the skin from closing, before the bottom of the sore had healed.

Mr. Hunter thinks it doubtful whether the application of mercury should be continued through the whole suppuration. He was inclined to continue it; but, in a smaller quantity.

There has been much dispute, whether a bubo should be opened, or allowed to burst of itself, and whether the opening should be made with a cutting instrument, or caustic. On this subject, Mr. Hunter remarks, that there is no peculiarity in a venereal abscess to make one practice more eligible, than another. The surgeon, he says, should in some degree be guided by the patient. Some patients are afraid of caustics; others, of cutting instruments. But, when the surgeon has the choice, Mr. Hunter expresses a preference to opening the bubo with a lancet, in which method, no skin is lost. But he observes, that when a bubo is very large, and there will be a great deal of loose skin, after the discharge of the matter, he thinks, that caustic may, perhaps, be better, as it will destroy some of the redundant skin, and occasion less inflammation, than what is caused by an incision. The potassa cum calce is the caustic commonly employed.

After the bubo has been opened, surgeons usually poultice it, as long as the discharge and inflammation are considerable, and then they employ dressings, which must be of such a quality, as numerous undescribable circumstances may indicate. The use of mercury, in the mean while, is to be continued, both to make the bubo heal, and prevent the bad effects, which might otherwise arise from the matter being continually absorbed. The mercury should also be rubbed in, so as to pass, if possible, through the diseased groin.

The mercurial course is to be pursued, till the sore is no longer venereal. But, in general, since this point is difficult to ascertain, the mercury must be given till the part has healed, and even somewhat longer, when the bubo has healed very quickly; for, the constitution is afterwards very apt to become contaminated.

However, mercury is not to be continued thus long in all cases; for, as Mr. Hunter explains, buboes often assume, besides the venereal, other dispositions, which mercury cannot cure; but, will even exasperate.

### CONSEQUENCES OF BUBOES.

Sometimes the sores, when they are losing, or entirely deprived of the venereal disposition, become changed into ulcers of another kind, and, most probably of various kinds. How far it is a disease arising from a venereal taint, and the effects of a mercurial course jointly, says Mr. Hunter, is not certain. This writer suspected, however, that the nature of the part, or constitution, had a principal share in the malady.

Mr. Hunter observes, that such diseases make the cure of the venereal affection much more uncertain, because, when the sore becomes stationary, or the mercury begins to disagree, we are ready to suspect, that the virus is gone; but, this is not always the case. Perhaps, the action of the venereal poison is only suspended, and will commence again, as soon as the other disease ceases.

In these cases, Mr. Hunter recommends attacking the predominant disease; but, he allows that there is difficulty in ascertaining its nature, and finding out, whether it is venereal, or not.

The same author also acquaints us, that he has seen some buboes exceedingly painful and tender to almost every thing, that touched them, and the more mild the dressings were, the more painful the parts became.

In some instances, the skin only seems to become diseased. The ulceration spreads to the surrounding integuments, while a new skin forms in the centre, and keeps pace with the ulceration, so that an irregular sore, which Mr. Hunter compares with a worm-eaten groove, is formed all round. It appears only to have the power of contaminating the parts, which have not yet been affected; and those, which have, readily heal.

When buboes become stationary, and seem little inclined to spread, attended with a sinus, or two, hemlock, joined with bark, is, according to Mr. Hunter, the medicine most frequently serviceable. It is best to use it both externally and internally. The same author also speaks favourably of sarsaparilla, sea-bathing, and sea-water poultices. He states, that at the Lock Hospital, gold refiners' water has been found a useful application; that, in some cases, drinking large quantities of orange-juice, and in others taking mezereon, have been found serviceable.

### LUES VENEREA.

Surgeons imply, that a *lues venerea* has taken place, when the venereal virus has been absorbed into the circulation. Mr. Hunter does not think the epithet *constitutional* strictly proper in its application to this form of the venereal disease. By *constitutional* disease, he observes, he should understand that, in which every part of the body is acting in one way, as in fevers of all kinds; but, the venereal poison seems to be only diffused through the circulating fluids, and, as it were, to force certain parts of the body to assume the venereal action, which action is perfectly local. To use Mr. Hunter's phrase, it takes place in different parts in a regular succession of susceptibilities. Only a few parts are acting at the same time; and a person may be constitutionally affected in this way, and yet almost every function may be perfect.

The venereal poison is generally conveyed into the system from a chancre. It may, also, according to Mr. Hunter's doctrine, be absorbed from a gonorrhœa. There is likewise a possibility of its getting into the circulation from the surface of the body, without any previous ulceration. It may be absorbed from common ulcers, without necessarily rendering these venereal; and it may be taken up from wounds, in which cases, it in general induces a previous ulceration in the wound.

### VENEREAL ULCERS.

In consequence of the blood being contaminated with real venereal pus, it might be expected, that the local effects, thus produced, would be similar in their nature to those, producing them. Mr. Hunter believed, that this is not the case. He notices, that the local effects, from a constitutional contamination, are all of one kind, viz. ulcers, let the effects make their appearance on any surface whatever, either the throat, or common skin. But, Mr. Hunter conceived, that if the matter, when in the constitution, were to act upon the same specific principles, as that, which is externally applied, a gonorrhœa would arise, when it affected a canal, and, only sores, or chancres, when it attacked other surfaces.

Mr. Hunter found, that even the sores, which are caused in the throat, are very different from chancres. He says, that the true chancre produces considerable inflammation, often attended with a great deal of pain, and quickly followed by suppuration. But, the local effects, arising from the virus in the constitution, are slow in their progress, attended with little inflammation, and are seldom or never painful, except in particular parts. However, Mr. Hunter allows, that this sluggishness in the effects of the poison depends on the nature of the parts diseased; and, he owns, that when the tonsils, uvula, or nose, are affected, the progress of the morbid mischief is rapid, and bears a greater resemblance to a chancre, than when it occurs on the skin. Even in those parts Mr. Hunter thought, that the ulcers were attended with less inflammation, than chancres, which were spreading with equal celerity.

The matter, secreted by such sores, as arise from a constitutional contamination, was always considered, before the time of Mr. Hunter, as being of a poisonous quality, like the matter of a chancre. At first, one would certainly expect, that this was actually the case, because venereal matter is the cause, and mercury cures chancres, and also ulcers proceeding from a lues venerea. Mr. Hunter remarks, however, that the latter circumstance is not a decisive proof, since mercury is capable of curing many diseases, besides the venereal. He also takes notice, that when pus is absorbed from a chancre, it generally produces a bubo; but, that a bubo is never occasioned by the absorption of matter from a venereal sore, arising from the virus diffused in the circulation. For instance, when there is a venereal ulcer in the throat, no buboes occur in the glands of the neck; when there are syphilitic sores on the arms, or even suppurating nodes on the ulna, no swellings form in the glands of the arm-pit, although these complaints occur, when fresh venereal matter is applied to a common sore on the arm, hand, or fingers. No swelling is produced in the groin, in consequence of nodes, or blotches on the legs and thighs.

Some very important experiments are related in Mr. Hunter's Treatise on the Venereal Disease, in order to shew, that the matter from a gonorrhœa, or chancre, is capable of affecting a man locally, who has already got a lues venerea, and that the matter from secondary syphilitic sores has not the same power. The particulars, however, are too long to be inserted in this book.

### PARTS MOST SUSCEPTIBLE OF THE LUES VENEREA, &c.

Some parts of the body seem to be much less susceptible of the lues venerea, than others; indeed, Mr. Hunter observes, that, as far as our knowledge extends, certain parts cannot be affected at all. The brain, heart, stomach, liver, kidneys, and several other viscera, have never been known to be attacked by the lues venerea.

The *first order of parts*, or those, which become affected in the early stage of the lues venerea, are the skin, tonsils, nose, throat, inside of the mouth, and sometimes the tongue.

The *second order of parts*, or those, which are affected at a later period, are the periosteum, fasciæ, and bones.

Mr. Hunter conceived, that one great reason of the superficial parts of the body suffering the effects of the lues venerea sooner than the deep-seated ones, depended on the former being more exposed to external cold. Even the second order of parts do not all become diseased at the same time, nor every where at once. But, on the contrary, it is observed, that, those, which are nearest the external surface of the body, are first diseased, as, for instance, the periosteum, bones of the head, the tibia, ulna, bones of the nose, &c. Neither does the disease affect these bones on all sides equally; but, first on that side, which is next to the external surface. Mr. Hunter notices, however, that the susceptibility of particular bones does not altogether depend on their nearness to the skin; but, on this circumstance, and their hardness together.

After many ingenious observations, Mr. Hunter presents the reader of his treatise with the following summary of his doctrines of the lues venerea.

First; that most parts, if not all, that are affected in the lues venerea, are affected with the venereal irritation at the same time.

Secondly; that the parts, exposed to cold, are the first which admit the venereal action; then the deeper-seated parts according to their susceptibility for such action.

Thirdly; that the venereal disposition, when once formed in a part, must necessarily go on to form the venereal action.

Fourthly; that all parts of the body, under such disposition, do not run into action equally fast, some requiring six or eight weeks; others, as many months.

Fifthly; in the parts, which first come into action, the disease continues to increase, without wearing itself out; while those, which are second in time, follow the same course.

Sixthly; mercury hinders a disposition from forming, or, in other words, prevents contamination.

Seventhly; mercury does not destroy a disposition already formed.

Eighthly; mercury hinders the action from taking place, although the disposition be formed.

Ninthly; mercury cures the action.

On these principles, Mr. Hunter asserts, that the cure of the disease may be easily explained.

### SYMPTOMS OF LUES VENEREA.

Mr. Hunter remarks, that the time, necessary for the appearance, or production of the local effects, in parts most susceptible of the disease, after the virus has got into the constitution, is uncertain; but, he says, in general, it is about six weeks; in many cases, the period is much longer; in other instances, it is shorter. Sometimes, the local effects make their appearance within a fortnight after the possibility of absorption.

The effects, on other parts of the body, which are less susceptible of the venereal irritation, or slower in their action, are of course much later in making their appearance. Mr. Hunter also notices, that when the first and second order of parts are both contaminated, the effects, generally, do not begin to appear in the latter, till after a considerable time, and sometimes, not till those affecting the former parts have been cured.

Mr. Hunter, however, mentions his having seen instances, in which the periosteum, or bone, has been affected before any of the first order of parts: but, he was uncertain, whether the skin, or throat, would afterwards have become diseased, as the disorder was not allowed to go on.

In the first order of parts, most susceptible of the effects of lues venerea, the disease is much quicker in its progress, than in the second order of parts. Mr. Hunter represents, that the symptoms in each succeeding part, which becomes affected, are slower and slower in their progress, and of a more fixed kind. It was also an observation, made by the same ingenious writer, that similar parts come sooner into action, and appear to go on more rapidly with it, in proportion as they are nearer the source of the circulation. The disease appears earlier on the face, head, shoulders, and breast, and the eruptions suppurate sooner than on the legs.

### SYMPTOMS OF THE FIRST STAGE OF THE LUES VENEREA.

According to Mr. Hunter, the first symptoms of the disease, after absorption, appear either on the skin, or in the throat, or mouth.

### VENEREAL ERUPTIONS.

Mr. Hunter thought, that these generally occurred all over the body. It is accurately observed, however, by Dr. Bateman, that syphilitic affections of the skin commonly make their first appearance on the face, where they are usually copious, and on the hands and wrists. (*Pract. Synopsis of Cutaneous Diseases, p.* 332, *edit.* 3.) It is also noticed by the same well informed writer, that their colour is in general less livid, than that of ordinary eruptions, being of a brownish red of different shades; but, he states, that this is not universal; for, some of the syphilitic ecthymata have a bright red base in the beginning. Exposure to cold accelerates their progress, and increases their extent; while, on the other hand, warmth retards and ameliorates them. (*P.* 333.) The discolourations make the skin appear mottled, and many of the eruptions disappear, while others continue, and increase with the disease.

In other cases, the eruption comes on in distinct blotches, which are often not observed, till the scurf has begun to form. At other times, the eruption assumes the appearance of small distinct inflammations, containing matter, and resembling pimples, not being, however, so pyramidal, nor so red at the base. Mr. Hunter also observes, that venereal blotches, on their first coming out, are often attended with inflammation, which gives them a degree of transparency, which is generally greater in the summer, than the winter, especially, if the patient be kept warm. In a little time, this inflammation disappears, and the cuticle peels off in the form of a scurf. The latter occurrence often misleads the patient and the surgeon, who look upon this dying away of the inflammation, as a decay of the disease, till a succession of scurfs undeceives them. Mr. Hunter adds, that the discolourations of the cuticle arise from the venereal irritation, and are to be seldom regarded as a true inflammation, since they rarely have any of its characteristics, such as tumefaction and pain. However, he explains, that in parts, which are well covered, or which are constantly in contact with other parts, there is more of the true inflammatory appearance, especially, about the anus.

The parts affected next begin to alter their appearance, and form a copper-coloured, dry, inelastic cuticle, called a scurf. This is thrown off, and new ones are formed. Mr. Hunter relates, that these appearances spread to the breadth of a sixpence or shilling; but, seldom more extensively, at least, for a considerable time. In the mean while, every succeeding scurf becomes thicker and thicker, till at last it becomes a common scab. Then the disposition for the formation of matter takes place in the cutis underneath, and a true ulcer is produced, which commonly spreads, although in a slow way.

These appearances arise first from the gradual loss of the true sound cuticle, which the diseased cutis cannot reproduce. As a kind of substitute for this want of cuticle, an exudation takes place, and forms a scale. The matter afterwards acquiring more consistence, at last forms a scab. However, before the disease has attained this condition, the cutis has ulcerated, after which the discharge is more like true pus. When this form of the lues venerea attacks the palms of the hands and soles of the feet, where the cuticle is thick, this latter part first becomes separated, and peels off. A new one is immediately formed, which also separates. In this manner a series of new cuticles take place, in consequence of scurfs not being so readily formed there as on the common skin. When the disease is confined to the palms of the hands, or soles of the feet, Mr. Hunter mentions, that there is difficulty in determining whether it is venereal, or not; because, most diseases of the cutis, in these situations, produce a separation of the cuticle, attended with the same appearances in all, and having nothing characteristic of the venereal disease.

When the affected part of the skin is opposed by another portion of skin, which keeps it in some degree more moist, as between the nates, about the arms, between the scrotum and the thigh, in the angle between the two thighs, on the red part of the lip, or in the arm pits, the eruptions, instead of being attended with scurfs and scabs, become accompanied by an elevation of the skin, which is swollen with extravasated lymph into a white, soft, moist, flat surface, which discharges a white matter.

Mr Carlisle has recently pointed out an herpetic abrasion of the cuticle, sometimes on the breast, or abdomen, which looks like venereal blotches He states, that it is less deep in the skin; that it has less of an inflammatory base; and that it is not so distinctly circumscribed, as the true venereal blotch. It never forms a purulent crust; but, is simply a furfuraceous scaling of the cuticle. He observes, that this form of disease seems to be produced by a disordered stomach and liver (See *Lon. Med. Reposit. Vol.* 7, *p.* 92.)

A venereal eruption often attacks that part of the fingers, on which the nail is formed. Here, the disease renders that surface red, which is seen shining through the nail; and, if allowed to continue, a separation of the nail takes place, similar to that of the cuticle in the above cases. However, Mr. Hunter states, that there cannot be the same regular succession of nails, as of cuticles in other instances.

Such surfaces of the body, as are covered with hair, may also be attacked, and the hair separates, and cannot be reproduced as long as the disease lasts.

It must be allowed, that it is frequently very difficult to say, whether an eruption is syphilitic, or not, and an opinion should rather be formed from the history of the case, than from any particular appearance of the eruption itself. As Dr Bateman has remarked, the cutaneous eruptions, which are the result of the venereal poison, are often the source of considerable embarrassment to the practitioner. They assume such a variety of forms, that they bid defiance to any arrangement founded upon their external character; and, in fact, they possess no common, or exclusive marks, by which their nature and origin are indicated. There is, perhaps, no order of cutaneous appearances, and scarcely any genus, or species of the chronic eruptions, so admirably described by Dr. Bateman, which these secondary symptoms of syphilis do not occasionally resemble. This gentleman admits, however, that, in many cases, there is a difference, which a practised eye will recognize, between the ordinary diseases of the skin and the syphilitic eruptions, to which the same generic appellation might be given. This, says he, is often observable in the shade of colour, in the situation occupied by the eruption, in the mode of its distribution, and in the general complexion of the patient. Hence, to a person conversant with those ordinary diseases, a degree of anomaly in these respects will immediately excite a suspicion, which will lead him to investigate the history of the progress of such an eruption, and of its concomitant symptoms. (See *Bateman's Practical Synopsis of Cutaneous Diseases, p.* 331—332, *edit.* 3.)

Considerable light is also often thrown on these doubtful cases, by a review and consideration of the remedies which have been previously administered, and the effects, which they appeared to produce.

For an account of the ordinary chronic eruptions, to which syphilitic affections of the skin are most nearly allied, I must refer the reader to Dr. Bateman's valuable publication.

### VENEREAL DISEASE OF THE THROAT, MOUTH, AND TONGUE.

In the throat, tonsils, and inside of the mouth, the disease generally makes its appearance at once in the form of an ulcer, without much previous tumefaction. Consequently, the tonsils are not much enlarged. It is observed by Mr. Hunter, that, the venereal inflammation attacks the surface of these parts, and very soon produces a sore.

A venereal ulcer in the throat should be carefully distinguished from other kinds of sores in the same situation. The syphilitic one is in general tolerably well marked. However, Mr. Hunter confesses, that, it may not in every instance be distinguishable from an ulcer of a different nature. Sores in the throat, which are really venereal, may resemble others which are not so. The same celebrated author mentions, that there are several diseases of this part, which do not produce ulceration on the surface. One of these is common inflammation of the tonsils. The inflamed place often suppurates in the centre, so as to form an abscess, which bursts by a small opening; but, never looks like an ulcer, that has begun upon the surface, like a true venereal one. The case, just alluded to, is always attended with too much inflammation, pain, and tumefaction, of the parts, to be venereal. Also when it suppurates and bursts, it subsides directly, and it is generally attended with other inflammatory symptoms in the constitution.

Mr. Hunter next takes notice of another disease, consisting of an indolent tumefaction of the tonsils, and peculiar to many persons, whose constitutions are disposed to scrophula. The complaint produces a thickness in the speech. Sometimes coagulable lymph is thrown out on the surface of the parts affected, and occasions appearances, which are by some called ulcers; by some, sloughs; and occasionally, by others, putrid sore-throats. The case is attended with too much swelling to be venereal, and, with a little care, it may easily be distinguished from an ulcer, or loss of substance. However, when this difference is not obvious at first sight, it is proper to endeavour to remove some of the lymph, and, if the surface of the tonsil underneath should appear to be free from ulceration, we may conclude with certainty, that the disease is not venereal. Mr. Hunter states, that he has seen a chink filled with coagulable lymph, so as to appear very much like an ulcer; but, on removing that substance, the tonsil underneath was found perfectly sound. He adds, that he has seen cases of a swelled tonsil, having a slough in its centre, which slough, before its detachment, looked very like a foul ulcer. The stage of the complaint, he says, is even more puzzling, when the slough has come out; for, then the disease has most of the characters of the venereal ulcer. Whenever he met with the disease in its first stage, he always treated it, as if it had been of the nature of erysipelas, or a carbuncle. When the complaint is in its second stage, without any preceding local symptoms, he recommends the practitioner to suspend his judgment, and to wait a little, in order to see how far nature is able to relieve herself. If there should have been any preceding fever, the case is still less likely to be venereal. Mr. Hunter informs us, that he has seen a sore-throat of this kind mistaken for venereal, and mercury given, till it affected the mouth, when the medicine brought on a mortification of all the parts concerned in the first disease.

Another complaint of these parts, which Mr. Hunter represents as being often taken for a venereal one, is an ulcerous excoriation, which runs along their surface, becoming very broad and sometimes foul, having a regular termination, but, never going deeply into the substance of the parts, as the venereal ulcer does. No part of the inside of the mouth is exempted from this ulcerous excoriation; but, Mr. Hunter thought that the disease most frequently occurred about the root of the uvula, and spread forwards along the palatum molle. He remarks, that the complaint is evidently not venereal, since it does not yield to mercury. He has seen these ulcerous excoriations continue for weeks, without undergoing any change, and a true venereal ulcer make its appearance on the surface of the excoriated part. He says, that the excoriations in question have been cured by bark, after the end of the mercurial course, which cured the syphilitic sore.

This author describes the true venereal ulcer in the throat, as a fair loss of substance, part being dug out, as it were, from the body of the tonsil; it has a determined edge, and is commonly very foul, having thick white matter, like a slough, adhering to it, and not admitting of being washed away. Ulcers in such situations are always kept in a moist state, and the matter cannot dry and form scabs, as it does on sores upon the skin. The ulcer is also much more rapid in its progress, and generally has thickened edges.

When lues venerea attacks the tongue, it sometimes produces a thickening and hardening of the part. However, it also frequently gives rise to ulceration, as in other parts of the mouth.

Venereal sores on the tongue, are generally more painful, than those on the skin; but, less so, than common sore-throats from inflamed tonsils. They oblige the patient to speak thick, as if his tongue were too large for his mouth, with a small degree of snuffling.

Mr Hunter doubted the reality of a venereal ophthalmy, though he owns there are inflammations of the eyes, which yield to mercury. The case commonly supposed to be venereal, is described in the article *Ophthalmy.*

### SYMPTOMS OF THE SECOND STAGE OF THE LUES VENEREA.

The second order of parts, or those, which are commonly affected at a later period, may occasionally assume the venereal action, before the disease has produced its local effects on the first order of parts; and they may even go on with the action, in many cases, after these latter have taken on the action, and been cured.

The periosteum, fasciæ, tendons, ligaments, and bones, are the parts which are usually affected in the second stage of the lues venerea. Mr. Hunter remarks, however, that we cannot always know with certainty what parts may become affected in this stage of the disease. He says, he has known the distemper produce a total deafness, sometimes followed by suppuration, and great pain in the ear, and side of the head. We have already explained, that it was one of this gentleman's doctrines, that the second order of parts were generally deep-seated. When these become irritated by the poison, he observes, that the progress of the disease is more gradual, than in the first order of parts. It assumes very much the character of scrophulous swellings, or chronic rheumatism; only it affects the joints, less frequently, than the latter affection does. A swelling sometimes makes its appearance on a bone, when there has been no possible means of catching the infection for many months; and, in consequence of the little pain experienced, the tumour may be of some considerable size, before it is noticed. Sometimes, a great deal of pain is felt; but, no swelling comes on, till after a long while. Mr. Hunter states, that these remarks are also applicable to swellings of the tendons, and fasciæ. As tumours of this kind only increase by slow degrees, they are not attended with symptoms of much inflammation. When they attack the periosteum, they seem like an enlargement of the bone itself, in consequence of being very firm, and closely connected with the latter part. Mr. Hunter also further observes, that, in these advanced stages of the disease, the inflammation can hardly get beyond the adhesive kind, in which state, it continues to become worse and worse, and when matter is formed, it is not true pus, but of a slimy description. Some nodes, he says, both of the tendons and bones, last for years, before they form any matter at all. These cases, he mentions as not being certainly venereal, though commonly considered as such.

It is not easy to explain the reason, why, when lues venerea attacks the bones, or the periosteum, the pain should sometimes be very considerable, and, sometimes, very trivial. The pains are usually of a periodical kind, being, in general, most severe in the night-time.

At the present day, when venereal cases are cured by much smaller doses of mercury, than were given in Mr. Hunter'stime, nodes have become much less frequent, and I have already in a previous part of this article expressed my decided belief, that a disposition to nodes was formerly often occasioned by the abuse of mercury.

### TREATMENT OF LUES VENEREA.

The first order of parts, or those which are most susceptible of being affected in lues venerea, are also the most easy of cure; while the second order of parts take more time to be remedied.

In the class of complaints, arising in the second stage of the lues venerea, Mr. Hunter believed, that it was unnecessary to continue the employment of mercury, till all the swelling had disappeared. For, it is observed by this distinguished writer, that, since these local complaints cannot contaminate the constitution by re-absorption, and since the venereal disposition and action from the constitution can be cured, while the local effects still remain, and this even when the tumefaction, forming nodes on the bones, fasciæ, &c. has proceeded to suppuration, there can be no occasion for continuing the course, after the venereal action has been destroyed. Mr. Hunter thought, that in this latter stage of the lues venerea, the syphilitic irritation was more easy of cure, than the swelling and other effects of that irritation.

Mercury, in the lues venerea, as well as in cases of chancres, is the great specific. In the present state of our knowledge, nothing else can be so well depended upon; but, it should always be employed with moderation, lest it produce worse effects, and more terrible diseases, than those, which it is designed to relieve.

For an account of the various ways of exhibiting this valuable medicine, I must refer the reader to the article *Mercury*, in this Dictionary.

In curing the lues venerea, mercury can only have two modes of action; one on the poison; the other on the constitution. If, says Mr. Hunter, mercury acted on the poison only, one might conceive it did so, either by destroying its qualities, by decomposing it, or else by attracting it and carrying it out of the circulation. If mercury acted in the first of these ways, one would expect, that the cure would depend on the quantity of the medicine taken into the system. If it acted in the second manner, one would infer, that, the progress of the cure would be proportionate to the quantity of evacuation. But, observes Mr. Hunter, if it act upon the principle of destroying the diseased action of the living parts, and of counteracting the venereal irritation, by producing one of a different kind, then, neither quantity alone, nor evacuations, will avail much. He states, that the quickness of the cure depends on quantity, joined with visible effects. However, it is added, that, although the effects, which mercury has upon the venereal disease, are in some degree proportioned to the local effects of the medicine on some of the glands, or particular parts of the body, as the mouth, skin, kidneys, and intestines, yet such effects are not altogether proportioned to these other circumstances. When mercury disagrees with the constitution, so as to produce great irritability and hectic symptoms, this action or irritation, as Mr. Hunter explains, is not a counter-irritation to the venereal disease.

It was also noticed by the same author, that the effects of mercury on lues venerea, are always in proportion to the quantity of the remedy, exhibited in a given time, and the susceptibility of the constitution to the mercurial irritation. He says, that these circumstances require the most minute attention, and that, in order to obtain the greatest action of mercury with safety, and in the most effectual manner, the medicine must be given, till it produces effects somewhere. However, it must not be exhibited too quickly, in order that a sufficient quantity may be given, before we are obliged to stop, in consequence of the effects. Mr. Hunter justly informs us, that when the local effects are produced too quickly, they prevent a sufficient quantity of the remedy from being taken into the system to counteract the venereal irritation at large.

Mr. Hunter mentions his having seen some cases, in which mercury acted very readily locally, and, yet the constitution was hardly affected by it, for the disease would not give way. He states, that he has met with other cases, in which the mere quantity of mercury did not answer, till it was given so quickly as to affect the constitution in such a manner, as to produce local irritation, and, consequently, sensible evacuations. This, he observes, is a proof, that the local effects of mercury are often the sign of its specific effects on the constitution at large, and it shows, that the susceptibility of the diseased parts to be affected by the medicine, is in proportion to its effects on the mouth. Its effects, he contends, are not to be imputed to evacuation; but, to its irritation. Hence, he inculcates, that mercury should be given, if possible, in such a manner, as to produce sensible effects upon some parts of the body, and in the largest quantity that can be given, to produce these effects within certain bounds. Mr. Hunter also remarks, that these sensible effects should be the means of determining, how far the medicine may be pushed, so as to have the greatest effect on the disease, without endangering the constitution. The practice must vary according to circumstances; and if the disease is in a violent degree, less regard must be had to the constitution, and mercury must be thrown into the system in larger quantities.

Mr. Hunter likewise acquaints us, that, when the disease is in the first order of parts, a smaller quantity of mercury is necessary, than when the second order of parts are affected, and the disease has been of long standing, its first appearances alone being cured, and the venereal disposition still remaining in the secondary parts. For the purpose of curing the venereal disease, whether in the form of chancre, bubo, or lues venerea, Mr. Hunter was of opinion, that probably the same quantity of mercury is necessary. He represents, that one sore requires as much mercury as fifty sores in the same person, and a small sore as much as a large one. He thought, that the only difference, if there is any, must depend upon the nature of the parts affected, that is, on their being naturally active or indolent. He conceived, however, that, on the whole, recent venereal complaints are generally more difficult of cure, than the symptoms of lues venerea, and that this may make a difference, in regard to the quantity of mercury necessary.

Having now delivered the principal general instructions, relative to the exhibition of mercury in the treatment of the venereal disease, as given by Mr. Hunter, I must not quit the subject, without remarking, that even this eminent surgeon appears on the whole too partial to the long use of mercury, and sometimes to the introduction of immoderate quantities of it into the system. In general, however, his observations tend to condemn all violent salivations. It is to be recollected, that, in his days, nobody had a suspicion that truly syphilitic sores would in the end spontaneously heal, and he himself had no dependance upon any medicine, except mercury, for the cure of the true venereal disease. But, modern experience evinces, that the disorder seldom now presents itself in forms so bad and intractable as formerly; that it is even capable of spontaneously ceasing; and that we hardly ever see cases, in which it is requisite to give mercury, except in very moderate quantities. Indeed, such is the change, that many surgeons suspect that the very nature of the disease must have undergone a material alteration, or modification. In England, in my opinion, every thing is to be referred to the improved manner of employing mercury only in moderate doses, and never pushing its exhibition, till the constitution is so impaired, that undescribable forms of diseases ensue, which are sometimes the compound effect of mercury and syphilis together; and, in other instances, of that description, which surgeons now frequently call *syphiloid*, or *pseudosyphilitic*, not depending upon the venereal poison at all, but upon a state of the system, which mercury is known to aggravate in the worst degree.

The principles above laid down, and other observations, contained in the article *Mercury*, must suffice for the direction of the cure of lues venerea by this great specific remedy. Other information, connected with the subject, will be found by referring to *Acidum Nitricum, Guaiacum, Mezereon, Sarsaparilla*, &c.

With respect to the local treatment of the symptoms of lues venerea, Mr. Hunter thought, that none would in general be necessary, since the constitutional treatment would commonly effect a cure.

The same writer notices, however, that sometimes the local effects will not give way, and the parts remain swollen in an indolent inactive state, even after there is every reason to believe, that the constitution is perfectly cured. In such cases, he recommends assisting the constitutional treatment by local applications of mercury to the part, either in the form of a plaster, or ointment. The latter application, he says, is the best. When these are not sufficient, he advises an attempt to be made to excite inflammation of another kind. He says, he has seen a venereal node, which gave excruciating pain, cured by merely making an incision down to the bone, the whole length of the node. The pain ceased, the swelling decreased, and the sore healed up kindly, without the assistance of a grain of mercury. He mentions, that blisters have been applied to nodes with success, removing the pain, and taking away the swelling.

With regard to these last cases, I may add, that, for many years past, the idea of completely dispersing nodes by mercury has been entirely abandoned in St. Bartholomew's hospital. In this institution, long protracted mercurial courses for the cure of such swellings are totally relinquished. When small moderate quantities of mercury have had their full effect, a blister is applied over the swelling, and kept open, under which plan the tumour generally subsides as far as its nature will allow.

It is curious, that a venereal ophthalmy, that very case whose real existence was doubted by Hunter, is a thing, that has been lately pointed out as an actual criterion of syphilis, when other symptoms only afford suspicion and doubt. "There is (says Mr. Carlisle) one sign, which I have never found to deceive me, whenever it occurs; and that is an ophthalmia, where the pupil is irregularly contracted, so as to destroy its circular appearance. The venereal inflammation of the iris draws the pupil into corners, or angular lines. At first, it is often accompanied by a muddiness of the transparent front of the eye; but, whether in the aqueous humour, or in the cornea, is not certain. The same inflammation, when very active, generally extends to the choroid membrane, and renders the eye highly irritable to light. Whenever the pupil is thus deformed, and any other, even equivocal signs of syphilis exist, I deem it a sufficient evidence for the employment of mercury. I have often seen the venereal ophthalmia put on the chronic type, and, in one instance, the choroid veins in a distended state, protruded through the pupil. The whole globe of the eye was at the same time much enlarged, and the organ was totally spoiled. After a seven week's course of mercury, the eye recovered its natural size, the veins disappeared, and a partial vision returned. In another example, I saw a distinct venereal ulcer, with a protruding margin, upon the iris, discharging pus into the aqueous chamber, and which was shewn at the time to all the students of the Westminster Hospital. It healed during the second week of the mercurial course, and all the attendant venereal symptoms dispersed at the close of the seventh week." (See *London Med. Repository, Vol.* 7, *p.* 91.) Mr. Carlisle also considers gummi as another distinguishing mark of the venereal disease. "Those swellings, (he observes) appear to be formed in the adipose membrane, and their locality is not regulated; they are usually the concomitants of an obscure state of the disease; they seem especially to follow the inefficacious use of mercury, or a mild form of original infection. They are more often a ternary and distant recurrence of the disease, than a secondary and speedy re-appearance. They most frequently arise in apparently ill-conditioned habits, and are slow in their progress. I have many times adopted this leading symptom to decide upon the case, when all the other evidences were unsatisfactory." (Op. cit.) Mr. Carlisle thinks, also, that there is constantly a cadaverous aspect attending all constitutional venereal affections. He asserts, that he has seen a venereal pneumonia; and a syphilitic carbuncle.

### DISEASES RESEMBLING THE VENEREAL.—PSEUDO-SYPHILIS.

Sores on the glans penis, prepuce, &c. in the form of chancres, as Mr. Hunter notices, may and do arise without any venereal infection, although in general they are a consequence of former venereal sores, which have been cured.

The symptoms, produced by the venereal poison in the constitution, are such as are common to many other diseases. For instance, Mr. Hunter remarks, that blotches on the skin are common to what is called a scorbutic habit; pains are common to rheumatism; swellings of the bones, periosteum, fasciæ, &c. to many bad habits, perhaps, of the scrophulous and rheumatic kind. Thus, says this valuable writer, most of the symptoms of the venereal disease, in all its forms, are to be found in many other diseases. Hence, the original cause, and many leading circumstances, such as dates, effects of the disorder upon others, from connexion, when only local, the previous and present symptoms, &c. must be considered, before we can determine absolutely what the disease truly is. All the circumstances and symptoms, taken together, may be such, as will attend no other disease. However, Mr. Hunter confesses, that with all our knowledge, and with all the application of that knowledge to suspicious symptoms of this disease, we are often mistaken, calling distempers venereal, which are not so, and sometimes supposing really syphilitic affections to be of another nature.

Mr. Hunter takes notice, that, in some constitutions, rheumatism, in many of its symptoms, resembles the lues venerea. The nocturnal pains, swelling of the tendons, ligaments, and periosteum, and pain in those swellings, are symptoms both of the rheumatism, and also of the venereal disease, when it attacks such parts. Mr. Hunter, however, did not know, that he had ever seen the lues venerea attack the joints, though many rheumatic complaints of such parts are cured by mercury, and therefore supposed to be venereal.

Mercury, given without caution, often produces the same symptoms as rheumatism. Mr. Hunter has seen such complaints supposed to be venereal, and the medicine continued.

This interesting author also explains, that some diseases not only resemble the venereal in appearance, but, in the mode of contamination, proving themselves to be poisons by affecting the part of contact; then producing immediate consequences similar to buboes; and also remote consequences similar to the lues venerea.

Mr. Hunter observes, that it is nearly as dangerous, in some constitutions, to give mercury, when the disease is not venereal, as to omit it in other cases, which are really syphilitic. Many of the constitutions, which put on some of the venereal symptoms, when the disease is not really present, are those, with which mercury seldom agrees, and commonly does harm. Mr. Hunter has seen mercury, which was exhibited for a supposed venereal ulcer of the tonsils, produce a mortification of those glands, and the patient was nearly destroyed

Mr. Abernethy, in his *Surgical Observations*, 1804, has treated at some length of diseases resembling syphilis, and has adduced several very interesting cases, which I advise every surgical practitioner to read with the greatest attention. The following case, recorded by this gentleman, I shall take the liberty of quoting.

"A gentleman (says Mr. Abernethy) thought, that he had infected a slight cut on his hand (which was situated in front of and just below the little finger) with the discharge from a bubo in the groin, that he had occasion to open. The wound fretted out into a sore about the size of a sixpence, which he shewed me, and which I affirmed had not the thickened edge and base, and other characters of a venereal chancre. I therefore recommended him to try the effect of local means, and not to use mercury.

"In about a month the sore, which had spread a little, became again contracted in its dimensions, and assumed an healing appearance. At this time pain was felt extending up the arm, and suddenly a considerable tumour arose over the absorbing vessels, which proceed along the inner edge of the biceps muscle. This tumour became nearly as big as a small orange. As the original sore seemed now disposed to heal, and as there was no surrounding induration, I could not believe it venereal, and therefore recommended him still to abstain from mercury, and apply leeches and linen moistened in the aq. litharg. acet. comp. to the tumour formed over the inflamed absorbents. For it seemed to me, that if the venereal poison had been imbibed from the sore, it would have passed on to one of the axillary glands, and would have caused induration and inflammation to take place there, more slowly, than had occurred on the present occasion.

"Under this treatment the tumour was discussed, and the sore at the same time healed. About three weeks afterwards the patient called on me, and said that there were venereal ulcers in his throat; and in each tonsil there was an ulcer deeply excavated, with irregular edges, and with a surface covered by adhering matter; ulcers, in short, which every surgeon, who depends on his sight as his guide, would have pronounced to be venereal. Shortly after also, some copper-coloured eruptions appeared on his face and breast. He shewed his diseases to several surgeons, on whose opinion he relied, who, without hesitation, affirmed that they were venereal, and that the mercurial course had been improperly delayed.

"Whilst the patient was looking out for lodgings, in order that he might go through the mercurial process, a circumscribed thickening and elevation of the pericranium covering the frontal bone, appeared: it was of the circumference of an half-crown piece; and was, in short, what every surgeon, who is guided only by his sight and touch, would, without hesitation, have called a fair corona veneris. I now told the patient that I was more inclined to believe his disease was not syphilitic, from the sudden and simultaneous occurrence of this node with the sore throat, &c. Other surgeons thought differently; and I believe this very sensible and amiable young man imagined, that his health would become a sacrifice, if he any longer attended to my opinion. He was preparing to submit to a mercurial course, when very important concerns called him instantly into the country. He went with great reluctance, taking with him mercurial ointment, &c.: and after a fortnight I received a letter from him, saying that he found his complaints benefited by his journey, that business had prevented him from beginning the use of mercury for a few days, that he now found it was unnecessary, for his symptoms had almost disappeared, and shortly afterwards he became perfectly well."

Mr. Abernethy considers this case as the most unequivocal instance extant of a disease occurring, which could not from appearance be distinguished by surgeons of the greatest experience from syphilis, and which, however, was undoubtedly of a different nature. He believes, that there is no one, who would not have decided on this case, as those did who declared it to be venereal, unless they had had an opportunity of very attentively watching its progress.

Mr. Abernethy, in the course of his remarks, makes it appear, that cases, which are venereal, and others, which are not, cannot in general be discriminated by the mere aspect of the affections. He believes, however, that there are some circumstances, in the progress of such different distempers, from which a line of distinction might be drawn.

A very simple fact has enabled this gentleman in most cases to distinguish the two diseases: "yet, simple as it is, (says Mr. Abernethy,) if it be generally true, it is very important; and if it were universally true, it would be of the highest consequence. The fact alluded to is, that the constitutional symptoms of the venereal disease are generally progressive, and never disappear unless medicine be employed. It may be added too, they are as generally relieved under an adequate effect of mercury on the constitution, &c.

"I have asked the opinion of several surgeons of great practice and abilities respecting this question; Whether constitutional symptoms of syphilis do ever spontaneously amend? and no one has decidedly replied in the affirmative, whilst all, without hesitation, agreed that they were generally progressive till checked by the effect of mercury. It seemed useless to seek further information; for what surgeon is there, at present, if he sees diseases, that cannot be distinguished by the sight from syphilis, and hears that they arose in consequence of a chancre, that would suspend his judgment, and forbear to administer mercury? If I have lived in the habit of so frequently detecting the imposing appearances of the secondary effects of these diseases, it is because I have been upon the watch, and because they have occurred in patients, in whom I have seen the primary sores, the appearance and progress of which have excited my suspicion as to their nature. I have stated the rule as general, but not universal; for I could myself relate cases of diseases, in which, from the great abatement, and even disappearance of symptoms, I have concluded the disease was not syphilitic; yet, from the duration of the disorder, or from the subsequent aggravation of its symptoms, the patient has desired, and I have recommended the use of mercury, and the disease has been treated as venereal, without its real nature being ascertained.

"The rule, which has been mentioned, relates to the constitutional symptoms of the venereal disease; for, the primary ones, chancres, do sometimes heal spontaneously, generally, however, though not constantly, leaving a thickening or induration of the affected part. They may also be induced to heal by topical means, without mercury, with similar events. Some enlargements of glands in the groin will also in like manner subside.

"It may be fairly supposed, that if some chancres heal spontaneously, that constitutional diseases arising from the same cause, may, in like manner, sometimes get better without medicine. The administration of nitrous acid, opium, and other remedies have been said to have amended, if not entirely cured, these constitutional diseases. But the question is, will they get better spontaneously? and the question can only be solved by experience. Delay will frequently enable a surgeon to decide; but, there are cases, in which no amendment takes place, and the surgeon is as it were forced, from the progress of the disease, to employ mercury.

"In recommending prudent delay and attentive observation, I hope and believe, (continues Mr. Abernethy,) that I am not recommending any thing likely to be of dangerous consequence. The venereal disease is generally soon checked by the use of mercury; and in constitutions, where much medicine is required to counteract its effects, that medicine may be given with freedom. By delay and observation, we perhaps may perceive, that eruptions and sore throats, which could not from appearance be distinguished from venereal, spontaneously amend: that some eruptions scale and become well, and the probability will of course be that the rest will do so likewise: or that an ulcer mends in one part though it may spread in another, when the natural inference is that the diseased actions in the sore will gradually cease, and health return spontaneously; and that what has occurred in one part of an ulcer, will successively take place in another.

"In recommending delay it cannot, I suppose, be thought that I would advise any one to wait till an ulcer destroyed the velum pendulum palati, or did material injury to any important part. There are cases where the progress of the disease obliges a surgeon to use mercury, even though he may be suspicious that it is not syphilitic. The effect of exciting a mercurial affection of the constitution in diseases resembling syphilis is, as far as my observation enables me to determine, very various. It sometimes cures them very suddenly and very differently from the gradual amendment, which it produces in truly venereal diseases. Sometimes, however, these diseases yield more slowly to its operation, and are cured permanently. Sometimes the diseases recur in the same parts after a severe course of mercury; sometimes mercury merely checks the disease, and can scarcely be said to cure it; in which case it seems important to support the strength of the constitution, and to keep up that mercurial effect which controuls the disease, and can be borne without material derangement of the constitution for a great length of time. Sometimes also the use of mercury aggravates these diseases.

"Again, in some constitutions, the venereal disease may assume unusual characters, and be very difficult to cure. It must then be scarcely possible to discriminate between these anomalous cases of syphilis and those of diseases resembling it, unless some new distinctions are discovered." (See *Surgical Observations, by John Abernethy, F. R. S.*)

Some years ago the nitric acid was introduced as a remedy in syphilis. (See *Acidum Nitrosum.*) It was first thus employed in India, where it appeared to cure the disease; but, of late years, its use has been nearly discontinued in England in all unequivocal venereal cases, on the ground of its being less efficacious, than mercury, and less to be depended upon. Dr. Scott, who first suggested its use, has lately attempted to account for this failure, by observing that the acid he employed was not pure nitric acid, but an impure acid, containing an admixture of muriatic acid. He therefore some time ago recommended the use of a compound acid, containing three parts of nitric acid, and one of muriatic, which he administered internally, and also applied externally, largely diluted, as a bath, until the gums were affected and ptyalism produced; and he conceived every trial as quite inconclusive, unless these constitutional effects occurred. Of late, however, he has employed the acids in equal weights.

"The acid, that I have used of late (says Dr. Scott,) is the nitro-muriatic; and it is formed by mixing together equal parts of the nitrous, or nitric acid, and muriatic acid. If these acids be in the state of concentration, that they usually possess in the shops, and if the quantities be considerable, a great volume of gas is evolved on their coming into contact, which taints every part of a house, is extremely hurtful to the lungs, and disagreeable to the smell. To avoid this inconvenience, I put a quantity of water, at least equal in bulk to both the acids, into a bottle, and I add the acids to it separately. This method does not only prevent the unpleasant odour, but it tends to retain the chlorine, on which its effects depend. It is well known, that the nitro-muriatic acid acts very readily on the metals and earth;

nothing therefore, but glass, or extremely well glazed vessels of porcelain, should be used to contain it. Wooden tubs for bathing answer very well, and they should always be made *as small as possible*, compatible with their holding the body, or the limbs that we wish to expose to the bath. From their being small, we save acid, and are able to heat the bath with ease. In India, I have often exposed the whole body below the head to this bath; but here I have been satisfied in general with keeping the legs and feet exposed to it. In order to warm the bath, after the first time, I have commonly made a third, or a fourth, part of it be thrown away, and the loss replaced by boiling water and a proportional quantity of acid. To save the expenditure of acid, I have occasionally warmed a portion of the bath in porcelain vessels, placed near the fire, but I fear this may diminish its effects.

"It is no easy matter (continues Dr. Scott) to give directions, with regard to the degree of acidity of the bath. I have commonly made it about as strong as very weak vinegar, trusting to the taste alone. The strength should be regulated by the degree of irritability of the patient's skin. I may say, that although I like to know, that it is strong enough to prick the skin a very little, after being exposed to it from fifteen to thirty minutes, yet I believe that even such an effect as this is unnecessary.

"The time too of remaining in the bath, in order to produce the greatest effect, is a matter of doubt. I have kept the legs and feet exposed to it for half an hour, or more; but, with more delicate people, not above one half, or one third of that time. I have repeated these baths daily, or even twice, or thrice a day." (See *Medical and Chirurgical Trans. Vol. 8, p.* 181.) Dr. Scott adds, that the mere sponging the skin with nitro-muriatic acid, sufficiently diluted with water, gives rise to the very same effects as bathing, and is more easily adopted. Fifteen, or twenty minutes may be employed in the sponging, though he has found, that a much less time does produce very material effects."

Dr. Scott has found the nitro-muriatic acid particularly useful, even in this country, in that description of syphilis, which is termed pseudo-syphilis, and which he considers as real syphilis combined with scrophula, called into action by the mercury employed for the cure of the syphilitic affection, and consequently not curable by mercury, although syphilis be still in the habit, but undoubtedly not produced by that remedy. He attributes the beneficial effects to the chlorine, which is loosely combined in this compound. (See *Journal of Science and the Arts, Vol.* 1, *p.* 205—211; *London Medical Repository, Vol.* 7, *p.* 59; *and Medical and Chir. Trans. Vol.* 8, *p.* 173, *et seq.*)

Of the nitro-muriatic acid I have had no experience myself; but, I have always been accustomed to prescribe the nitric acid for diseases resembling syphilis, with decidedly beneficial effect. At Paris, during the winter before last, I used this medicine in several pseudo-syphilitic cases, and I thought more good was derived from it than any thing else, which was tried. The case of a surgeon, who was there under my care, would be interesting; but, my limits will not allow me to insert it.

For information concerning the venereal disease, the reader should particularly consult *Astruc de Morbis Venereis. John Vigo's Whole Works in Chirurgerie, by Gale*, 1586; *or the Latin edition published at Leyden, in* 1518. *Fallopius de Morbo Gallico. Antonius Musa Brasavolus in the Aphrodisiacus. Ulricus de Hutten de Morbo Gallico. Boerhaavius de Lue Venereâ*, 12*mo.* 1751. *Rondeletti Opera Omnia*, 4*to*; *Genevæ*, 1610. *Morgagni de Sedibus et Causis Morborum. Francantianus de Morbo Gallico*, 8*vo. Patav.* 1563. *Gataker on Venereal Complaints*, 1754. *Chapman on the Venereal Disease*, 1770. *Fordyce on the Venereal Disease, with an Appendix*, 1777. *Plenck Doctrina de Morbis Venereis. B. Bell's Treatise on Gonorrhæa Virulenta, and Lues Venerea, edit.* 2, 1797. *Lalonette's New Method of curing Diseases by Fumigation*, 8*vo.* 1777. *Hunter's Treatise on the Venereal Disease, edit.* 2.; *which is by far the most valuable work ever published on the subject. An Enquiry into some of the Effects of the Venereal Poison, &c. by S. Sawrey*, 1802. *J. Pearson's Observations on the Effects of various Articles of the Materia Medica in the Cure of Lues Venerea, edit.* 2, 1807. *Practical Observations on the Natural History and Cure of the Venereal Disease*, 2 *vol.* 8*vo. edit.* 2, 1806. *Practical Observations on Venereal Complaints, by F. Swediaur, edit.* 3. *Abernethy on Diseases resembling Syphilis, in his Surgical Observations*, 1804. *Adams on Morbid Poisons, edit.* 2. *Fergusson's Observations on the Venereal Disease in Portugal, as affecting the Constitutions of the British Soldiery and Natives, in Medical and Chirurgical Trans. Vol.* 4. *Hey's Tracts illustrating the Effects of the Venereal Disease on the Fœtus in Utero, in Medical and Chirurgical Trans. Vol.* 7, *p.* 541, *&c. Bateman's Practical Synopsis of Cutaneous Diseases; Edit.* 3, 1814. *M. Lagneau, Exposé des diverses Méthodes de traiter les Maladies Vénériennes, &c. 4me. Edit. Paris*, 1816. *H. Scott on the Internal and External Use of the Nitro-Muriatic Acid in the Cure of Diseases; in Medical and Chir. Trans. Vol.* 8, *p.* 173, *&c. Also in Journ. of Science and the Arts, Vol.* 1, *p.* 205, *&c. A. Carlisle's Remarks on the present unsettled State of Opinion, about the Venereal Disease in London, Medical Repository, Vol.* 7, *p.* 89, *&c. Carmichael on the Venereal Diseases, which have been confounded with Syphilis, &c.* 4*to.*

**VENESECTION**, (from *vena*, a vein, and *sectio*, a division.) The operation of opening a vein. Phlebotomy. This subject has already been spoken of in the article *Bleeding*.

**VERRU'CA.** A wart. (See *Wart.*)

**VE'RTEBRÆ, DISEASE OF.**

The disorder, which we are going to consider, is a disease of the spine, attended with a more, or less, complete loss of the power of using the legs.

From Mr. Pott we learn, that formerly it was generally called a palsy, and treated as a paralytic affection; to which it is in almost every respect perfectly unlike.

In the true paralysis, (says Mr. Pott,) from whatever cause, the muscles of the affected limb are soft, flabby, unresisting, and incapable of being put into even a tonic state; the limb itself may be placed in almost any position, or posture; if it be lifted up, and then let go, it falls down, and it is not in the power of the patient to prevent, or even to retard its fall: the joints are perfectly and easily moveable in any direction; if the affection be of the lower limbs, neither hips, knees, nor ankles, have any degree of rigidity, or stiffness; but, permit the limb to be turned, or twisted, in almost any manner.

In the present case, the muscles are indeed lessened, but, they are rigid, and always at least in a tonic state, by which the knees and ankles acquire a stiffness not very easy to overcome. By means of this stiffness, mixed with a kind of spasm, the legs of the patient are either constantly kept stretched out straight, in which case considerable force is required to bend the knees, or they are, by the action of the stronger muscles, drawn across each other, in such manner as to require as much to separate them. When the leg is in a straight position, the extensor muscles act so powerfully, as to require a considerable degree of force, to bend the joints of the knees; and, when they have been bent, the legs are immediately, and strongly, drawn up, with the heels toward the buttocks. By the rigidity of the ankle-joints joined to the spasmodic action of the gastrocnemii muscles, the patient's toes are pointed downward, in such manner as to render it impossible for him to put his foot flat to the ground: which makes one of the decisive characteristics of the distemper.

These (says Pott) are strong marks of the distinction, which ought to be made between the two diseases; and, fully sufficient to shew the impropriety of confounding them with each other.

The majority of those, who labour under this disease, are infants, or young children: adults are by no means exempt from it; but Mr. Pott never saw it at an age beyond forty.

Mr. Pott remarks, that, when it attacks a child, who is old enough to have walked properly, its awkward and imperfect manner of using its legs, is the circumstance, which first excites attention, and the incapacity of using them at all, which very soon follows, fixes that attention, and alarms the friends.

The account, most frequently given, is, that for some time previous to the incapacity, the child had been observed to be languid, listless, and very soon tired; that he was unwilling to move much, or briskly; that he had been observed frequently to trip and stumble, although no impediment lay in his way; that when he moved hastily, or unguardedly, his legs would cross each other involuntarily, by which he was often and suddenly thrown down; that if he endeavoured to stand still, and upright, unsupported by another person, his knees would totter and bend under him; that he could not, with any degree of precision or certainty, steadily direct either of his feet, to any particular point, but, that in attempting so to do, they would be suddenly, and involuntarily brought across each other; that soon after this, he complained of frequent pains and twitchings in his thighs, particularly when in bed, and of an uneasy sensation at the pit of his stomach; that when he sat on a chair, or a stool, his legs were almost always found across each other, and drawn up under the seat; and that in a little time after these particulars had been observed, he totally lost the power of walking.

The same author observes, that if the incurvation be of the neck, and to a considerable degree, by affecting several vertebræ, the child finds it inconvenient and painful to support its own head, and is always desirous of laying it on a table or pillow, or any thing to take off the weight. If the affection be of the dorsal vertebræ, the general marks of a distempered habit, such as loss of appetite, hard dry cough, laborious respiration, quick pulse, and disposition to hectic, appear pretty early, and in such a manner as to demand attention: and as, in this state of the case, there is always, from the connexion between the ribs, sternum, and spine, a great degree of crookedness of the trunk, these complaints are by every body set to the account of the deformity merely.

Mr. Pott states, that an adult, in a case, where no violence has been committed, or received, will tell you, that his first intimation was a sense of weakness in his back-bone, accompanied with what he will call a heavy dull kind of pain, attended with such a lassitude, as rendered a small degree of exercise fatiguing: that this was soon followed by an unusual sense of coldness in his thighs, not accountable for from the weather, and a palpable diminution of their sensibility. That in a little time more, his limbs were frequently convulsed by involuntary twitchings, particularly troublesome in the night; that soon after this, he not only became incapable of walking, but that his power either of retaining or discharging his urine and feces, was considerably impaired, and his penis became incapable of erection.

The adult also finds all the offices of his digestive, and respiratory organs much affected, and complains constantly of pain and tightness at his stomach.

In infants, the curve is seldom noticed till it has got to such size and state, as to demand attention from the deformity: previous to this, all the marks of distemper, which appear in the child, pass for the effects of general weakness, and are treated as such.

In an adult, the disease passes for rheumatism, or gravel, or a strain, and the defect in the limbs is the first thing, that occasions an enquiry into the state of the back-bone.

When a curvature, says Mr. Pott, is perceived in an infant, it is always supposed to have received a hurt by a blow, or fall, and an adult has always recourse to some exertion in pulling, drawing, lifting, or carrying, by which the spine is thought to have been deranged, or injured; but which supposition is seldom, if ever true, in either case.

The true cause of the disease, is a morbid state of the spine, and of some of the parts connected with it; which distempered state of parts will, upon careful enquiry, be always found to have preceded the deformity some length of time; in infants, this is the sole cause, and external violence has nothing to do with it. In the adult, (continues Mr. Pott,) I will not assert, that external mischief is always and totally out of the question; but, I will venture to affirm, what is equal, as far as regards the true nature of the case, which is, that although accident and violence may in some few instances be allowed to have contributed to its more immediate appearance, yet the part, in which it shews itself, must have been previously in a morbid state, and thereby predisposed for the production of it. I do not (says Mr. Pott) by this mean to say, that a violent exertion cannot injure the spine, nor produce a paralytic complaint, that would be to say more than I know; but, I will venture to assert, that no degree of violence whatever is capable of producing such an appearance as I am now speaking of, unless the bodies of the vertebræ were by previous distemper disposed to give way; and that no supposable dislocation, caused by mere violence done to the bones of the back, which bones were, before the receipt of the injury, in a sound state, can possibly be attended with the peculiar symptoms of a curved spine.

According to Mr. Pott, the true curvature is invariably uniform, in being from within outwards; but, it varies in situation, in extent, and in degree; it affects the neck, the back, or the loins; it comprehends one vertebra only, or two, or more; and as few or more are affected, or, as these are more or less morbid, and, consequently give way more or less, the curve must be different; but, whatever variety these circumstances may admit, the lower limbs alone usually feel the effect. Mr. Pott, however, had seen two cases, in one of which the arms only were affected; in the other, both legs and arms. Mr. Ford shewed him a lad, who had lost the use of both arms and legs from a curvature. An account of two similar examples was also communicated to Mr. Pott by Mr. Parke, of Liverpool. Some are, very soon after the curvature, rendered totally and absolutely incapable, not only of walking, but of using their legs in any manner; others can make shift to move about with the help of crutches, or by grasping their thighs just above the knees with both hands; some can sit in an armed chair, without much trouble or fatigue; others cannot sit up with any help; some retain such a degree of power of using their legs, as to be able to shift their posture when in bed; others have no such power, and are obliged to be moved upon all occasions.

Mr. Pott adds, that weak and delicate children are the most frequent subjects of this distemper; and when in these, it seizes on the dorsal vertebræ, great deformity of the trunk, both before, and behind, is the almost inevitable and necessary consequence; this will be different in different persons; but, let the difference in this be what it may, it is an adjunct circumstance, and upon due enquiry it will always be found, that the curvature from within outward, preceded the other deformity, and was, at one time, the only one to be seen.

Before the alteration of figure in the back-bone has been discovered, says Mr. Pott, all the attention is paid to the limbs, in which the whole disorder is supposed to reside; and all the applications for relief are made to them: frictions, liniments, embrocations, blisters, &c. to which is generally added cold bathing and electricity; when the curvature has been noticed, recourse is immediately had to back-boards, collars, steel boddice, swings, screw-chairs, and other pieces of machinery, but all to no purpose; the patient becomes daily more and more helpless and unhealthy, languishes for more or less time, and at last dies, either in an emaciated state, from an hectic, or by a drain from an abscess, formed within the body.

Mr. Pott contends, that the primary and sole cause of all the mischief, is a distempered state of the parts composing, or in immediate connexion with the spine, tending to, and most frequently ending in, a caries of the body, or bodies, of one or more of the vertebræ: from this proceed all the ills, whether general, or local, apparent or concealed; this causes the ill health of the patient, and, in time, the curvature. The helpless state of the limbs, is only one consequence of several, proceeding from the same cause; but, though this effect is a very frequent one, and always affects the limbs in nearly the same manner; yet, the disease not having its origin in them, no application made to them only, can ever be of any possible use.

The same failure of success (observes Mr. Pott) attends the use of the different pieces of machinery, and, for reasons, which are equally obvious.

They are all (says this author,) from the most simple, to the most complex, but particularly the swing and the screw, calculated to obviate and remove what does not exist. They are founded upon the supposition of an actual *dislocation*, which never is the case, and therefore they always have been, and ever must be, unsuccessful.

Mr. Pott states, that the bones are either already carious, or tending to become so; the parts connected with them are diseased, and not unfrequently ulcerated; there is no displacement of the vertebræ, with regard to each other, and the spine bends forward only because the rotten bone, or bones, intervening between the sound ones, give way, being unable, in such state, to bear the weight of the parts above. The most superficial reflection on this, must point out to every one, why attempts of this kind can do no good, and a little more attention to the subject will shew, why they may be productive of real, and great mischief.

Mr. Pott observes: When a child appears to be what the common people call naturally weakly, whatever complaints it may have, are supposed to be caused by its weak state, and it is generally believed, that time and common care will remove them; but, when a curvature has made its appearance, all these marks of ill health, such as laborious respiration, hard cough, quick pulse, hectical heat and flushing, pain and tightness of the stomach, &c. are more attentively regarded, and set to the account of the deformity consequent to the curve, more especially if the curvature be of the dorsal vertebræ, in which case the deformity is always greatest: but, whoever will carefully attend to all the circumstances of this disorder, will be convinced, that most, if not all the complaints of children, labouring under this infirmity, precede the curvature, and that a morbid state of the spine, and of the parts connected with it, is the original and primary cause of both.

Amongst many other reasons for thinking, that an effect was mistaken for a cause, Mr. Pott enumerates the following.

1. "That he did not remember ever to have seen this useless state of the limbs from a mere mal-formation of the spine, however crooked such mal-formation might have made it.

2. "That none of those deviations from right shape, which growing girls are so liable to, however great the deformity might be, was ever attended with this effect.

3. "That the kind of deformity, which was attended with this affection of the limbs, although it was different as to its degree, and its extent, in different people; yet, it was uniform in one circumstance, which was, that the curvature always was from within outwards.

4. "That since he had been particularly attentive to the disorder, he had observed, that neither the extent, nor degree of the curve, had in general produced any material difference in the symptoms, but that the smallest was, when perfectly formed, attended with the same consequences as the largest."

The first suggestion of the probability, that issues might prove serviceable in this disease, appears to have been made to Mr. Pott in a conversation which passed between him and the late Dr. Cameron, of Worcester, who told him that having remarked in Hippocrates, an account of a paralysis of the lower limbs, cured by an abscess in the back, he had, in a case of useless limbs, attended with a curvature of the spine, endeavoured to imitate this act of nature, by exciting a purulent discharge, and that it had proved very beneficial; which was confirmed to Mr. Pott by Mr. Jeffreys of Worcester, who had made the same experiment with the same success.

If the cure of this most dreadful distemper, observes Mr. Pott, had depended upon an application to the constitution in general, it might have required a variety of medicines, the administration of which must have demanded judgment, in adapting them to particular persons and constitutions; and it must also, in the nature of things, have happened, that many individuals could not have been benefited at all. But, fortunately for the afflicted, the means of relief are simple, uniform, and safely applicable to every individual, under almost every possible circumstance, not attended by the smallest degree of hazard, and capable of being executed by any body, who has the least portion of chirurgic knowledge; it consists merely in procuring a large discharge of matter, from the integuments, on each side of the distempered bones forming the curvature, and in maintaining such discharge until the patient shall have recovered his health and limbs. They who are little conversant with matters of this sort, (continues Mr. Pott,) will suppose the means very inadequate to the proposed end; but they who have been experimentally acquainted with the very wonderful effects of purulent drains, made from the immediate neighbourhood of diseases, will not be so much surprised at this particular one; and will immediately see how such kind of discharge, made, and continued from the distempered part, checks the further progress of the caries, gives nature an opportunity of exerting her own powers of throwing off the diseased parts, and of producing, by incarnation, an union of the bones (now rendered sound), and thereby establishing a cure.

Mr. Pott states, that it is a matter of very little importance towards the cure, by what means the discharge be procured, provided it be large, that it come from a sufficient depth, and, that it be continued for a sufficient length of time.

I have tried, says he, the different means of setons, issues by incision, and issues by caustic, and have found the last in general preferable, being least painful, most cleanly, most easily manageable, and capable of being longest continued.

The caustics, he observes, should be applied on each side of the curvature, in such a manner as to leave the portion of skin covering the spinal processes of the protruding bones, entire and unhurt, and so large, that the sores, upon the separation of the eschars, may easily hold each three or four peas, in the case of the smallest curvature; but, in large curves, at least as many more.

The issues, which modern surgeons usually make, for the relief of the symptoms arising from diseased vertebræ, are larger, than such as Mr. Pott himself was in the habit of forming. Practitioners now commonly prefer making an issue on each side of the spinous processes, about three, or four inches long, and half an inch broad. This leads me to speak of the method of making caustic issues in general, and of the best way of keeping them open.

The size of the issue, intended to be made, being determined, the place, where it is to be made, should be accurately marked out with ink. All the skin immediately around should then be covered with adhesive plaster, in order that it may be protected from the action of the caustic. Let the surgeon next take a piece of potassa, or of potassa cum calce, and wrap a little tow round one end of it, so that he may take hold of it with safety and convenience. The other end of the caustic should then be moistened a little, and rubbed very quickly on the portion of the integuments which is to be converted into an eschar. The caustic is to be rubbed in this manner, till the part turns of a dull brown colour, when the caustic should be carefully washed off with a little wet tow, and a poultice applied.

As soon as the eschars admit of being removed, a row of peas, or beans, connected together with thread, should be laid on the sore, and confined there with sticking plaster. A compress, containing a piece of pasteboard, or sheet lead, is then to be bound over the peas, or beans, with a roller. In consequence of the continued pressure, the peas, or beans, soon form little hollows for themselves, in which they should be regularly placed every day. When the pressure is not duly maintained, the granulations are apt to rise so high, that the peas cannot be well kept on the part. In this circumstance, the surgeon must try to repress the high surface of the sore, by sprinkling on it a little of the pulvis sabinæ et æruginis æris, mixed together in equal proportions. When this plan is unavailing, the re-application of the caustic becomes indispensable.

With respect to the treatment of diseased vertebræ, Mr. Pott observes, whatever length of time it may take to obtain a complete cure, by restoring the health as well as the limbs, the issues must be continued at least as long; and in his opinion, a considerable time longer, especially in the persons of infants and growing children.

Mr. Pott maintains, that this, and this only, does, or can, alleviate the misery attending this distemper, and in proper time effect a cure.

By means of these discharges, says he, the caries is first checked, and then stopped; in consequence of which an incarnation takes place, and the cartilages between the bodies of the vertebræ having been previously destroyed, the bones become united with each other, and form a kind of anchylosis.

According to Mr. Pott, nothing can be more uncertain than the time required for the cure of this distemper. He has seen it perfected in two or three months; and he has known it require two years; two thirds of which time passed before there was any visible amendment.

This author represents, that after the discharge has been made some time, very uncertain what, the patient is found to be better, in all general respects, and if of age to distinguish, will acknowledge, that he feels himself to be better in health; he begins to recover his appetite, gets refreshing sleep, and has a more quiet, and less hectical kind of pulse; but, the relief, which he feels above all others, is from having got rid of that distressing sensation of tightness about the stomach; in a little time more a degree of warmth, and a sensibility is felt in the thighs, which they had been strangers to for some time; and generally much about the same time, the power of retaining and discharging the urine and feces begins to be in some degree exerted.

The first return of the power of motion in the limbs, says Mr. Pott, is rather disagreeable; the motions being involuntary, and of the spasmodic kind, principally in the night; and generally attended with a sense of pain in all the muscles concerned.

At this point of amendment, if it may be so called, it is no uncommon thing, especially in bad cases, for the patient to stand some time without making any farther progress; this, in adults, occasions impatience, and in parents, despair; but, in the milder kind of case, the power of voluntary motion generally soon follows the involuntary.

The knees and ankles, by degrees, lose their stiffness, and the relaxation of the latter enables the patient to set his feet flat upon the ground, the certain mark that the power of walking will soon follow; but those joints, having lost their rigidity, become exceedingly weak, and are not for some time capable of serving the purpose of progression.

The first voluntary motions are weak, not constantly performable, nor even every day, and liable to great variation, from a number of accidental circumstances, both external and internal.

The first attempts to walk (continues Mr. Pott) are feeble, irregular, and unsteady, and bear every mark of nervous and muscular debility; the patient stands in need of much help, and his steps, with the best support, will be irregular and unsteady; but, when they have arrived thus far, this eminent surgeon had never seen an instance, in which they did not soon attain the full power of walking.

Mr. Pott adds, that when the patient can just walk, either with crutches, or between two supporters, he generally finds much trouble and inconvenience, in not being able to resist, or to regulate the more powerful action of the stronger muscles of the thigh over the weaker, by which his legs are frequently brought involuntarily across each other, and he is suddenly thrown down.

Adults find assistance in crutches, by laying hold of chairs, tables, &c. but the best and safest assistance for a child, is what is called a go-cart, of such height as to reach under the arms, and so made as to inclose the whole body: this takes all inconvenient weight off the legs, and at the same time enables the child to move them as much as it may please.

An attentive examination of the morbid appearances, and their effects, in different subjects, led Mr. Pott to conclude, amongst other things, that the disease, which produces these effects on the spine, and the parts in its vicinity, is what is in general called scrophula; that is, that same kind of indisposition as occasions the thick upper lip, the tedious obstinate ophthalmy, the indurated glands under the chin, and in the neck, the obstructed mesentery, the hard dry cough, the glairy swellings of the wrist and ankles, the thickened ligaments of the joints, the enlargement and caries of the bones, &c. &c. &c.

That ulceration or caries of the bodies of the vertebræ affected is the common morbid change and not enlargement.

That the curvature, which in this particular affection is always from within outward, is caused by the erosion, or destruction, of part of the body or bodies of one or more of the vertebræ; by which means that immediately above the distemper, and that immediately below it, are brought nearer to each other than they should be, the body of the patient bends forward, the spine is curved from within outward, and the tuberosity appears behind, occasioned by the protrusion of the spinal processes of the distempered vertebræ.

That according to the degree of carious erosion, and according to the number of vertebræ affected, the curve must be less or greater.

That when the attack is made upon the dorsal vertebræ, the sternum and ribs, for want of proper support, necessarily give way, and other deformity, additional to the curve, is thereby produced.

That this kind of caries is always confined to the bodies of the vertebræ, seldom or never affecting the articular processes.*

That without this erosive destruction of the bodies of the vertebræ, there can be no curvature of the kind here treated of; or, in other words, that erosion is the *sine quâ non* of this disease; that although there can be no true curve without caries, yet there is, and that not infrequently, caries without curve.

That the caries with curvature and useless limbs, is most frequently of the cervical or dorsal vertebræ, the caries without curve, of the lumbal, though this is by no means constant or necessary.

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* Mr. Pott mentions his having seen two cases in which the bodies of the vertebræ were totally separated from all connexion with the other parts, leaving the membrane, which included the spinal marrow, perfectly bare.

That, in the case of carious spine, without curvature, it most frequently happens, that internal abscesses, and collections of matter are formed, which matter makes its way outward, and appears in the hip, groin, or thigh; or, being detained within the body, destroys the patient: the real and immediate cause of whose death is seldom known, or even rightly guessed at, unless the dead body be examined.

That what are commonly called lumbal and psoas abscesses, are not infrequently produced in this manner, and, therefore, when we use these terms, we should be understood to mean only a description of the course which such matter has pursued in its way outward, or the place where it makes its appearance externally, the terms really meaning nothing more, nor conveying any precise idea of the nature, seat, or origin of a distemper subject to great variety, and from which variety its very different symptoms and events, in different subjects, can alone be accounted for.

That contrary to the general opinion, a caries of the spine is more frequently a cause, than an effect of these abscesses.

That the true curvature of the spine, from within outward, of which the paralytic, or useless state of the lower limbs, is a too frequent consequence, is itself but *one* effect of a distempered spine; such case being always attended with a number of complaints, which arise from the same cause: the generally received opinion, therefore, that all the attending symptoms are derived from the curvature, considered abstractedly, is by no means founded in truth, and may be productive of very erroneous conduct.

That in the case of true curvature, attended with useless limbs, there never is a *dislocation*, properly so called; but that the alteration in the figure of the back-bone, is caused solely by the erosion and destruction of a part of one or more of the corpora vertebrarum; and, that as there can be no true curvature without caries, it must be demonstrably clear, that there must have been a distempered state of parts previous to such erosion; from all which it follows, that this distemper, call it by what name you please, ought to be regarded as the original cause of the whole, that is, of the caries, of the curvature, and all the attendant mischiefs, be they what they may, general or particular.

That when two or more vertebræ are affected, forming a large curve, however perfect the success of the treatment may be with regard to the restoration of health, and limbs, yet the curvature will and must remain, in consequence of the union of the bones with each other.

That the useless state of the limbs is by no means a consequence of the altered figure of the spine, or of the disposition of the bones with regard to each other, but merely of the caries: of this truth there needs no other proof, than what may be drawn from the cure of a large and extensive curvature, in which three or more vertebræ were concerned: in this the deformity always remains unaltered and unalterable, notwithstanding the patient recovers both health and limbs.

Upon the whole, after due consideration of what has been said concerning the nature of the complaint, its producing cause, and the method by which it is capable of being cured, Mr. Pott says, he would ask, whether the diseased state of the spine, and of the parts connected with it, (which, if not prevented, must produce some of its very dreadful effects,) may not, by a timely use of proper means, be prevented?

He contends, that a morbid state of the parts, previous to deformity, caries, or curve, must be allowed: every complaint of the living, and every appearance in the dead, he says, prove it beyond contradiction or doubt. All the general complaints of persons, afflicted with this disorder, will always, upon careful inquiry, be found to have preceded any degree of deformity, to have increased as the curve became apparent, and to have decreased as the means used for relief took place; the pain and tightness about the stomach, the indigestion, the want of appetite, the disturbed sleep, &c. &c. gradually disappear, and the marks of returning health become observable, before the limbs recover the smallest degree of their power of moving.

Mr. Pott remarks, that on the other hand, it is as true, that when from extent, or degree, or inveteracy of the caries, the issues are found to be unequal to the wished-for effect, the general complaints receive no amendment; but increase until the patient sinks under them.

If all this be true, says Mr. Pott, which that it is, the manifold and repeated experience of many, as well as myself, can amply testify; and if it be found, that the issues are capable of effecting a perfect cure, even after a caries has taken place, and that to a considerable degree, which is also true to demonstration, is it not reasonable to conclude, that the same means, made use of in due time, might prove a preventive? (See *Pott on the Palsy of the lower Limbs.*)

**VINEGAR.** For an account of its uses in surgery, see *Acetum.*

**VIPER, BITE OF.** See *Wounds.*

**VOLVULUS.** (from *volvo*, to roll up.) See *Intussusception.*

# W.

WART. Mr. Hunter observes, that a wart appears to be an excrescence from the cutis, or a tumour forming upon it, by which means, it becomes covered with a cuticle, which is either strong and hard, or thin and soft, just as the cuticle is, which covers the parts, from which the excrescence arises. Warts are radiated from their basis to their circumference. The surface of the radii appears to be pointed, or granulated, like the surface of healthy granulations, with the exception of being harder, and rising higher. The surface, on which a wart is formed, seems only to be capable of producing one; for, the surrounding and connecting surface does not throw out a similar substance. Thus, when a wart has once begun to grow, it rises higher and higher, without becoming larger at its basis. Such excrescences seem to have within themselves the power of growing larger; for, as Hunter remarks, after they have risen above the surface of the skin, on which their basis cannot grow larger, they swell out into a round thick substance, which becomes rougher and rougher.

In consequence of having this structure, warts are very liable to be hurt by bodies rubbing against them, and, from such a cause, they often bleed very profusely, and are rendered sore and painful. (*Treatise on the Venereal Disease, p.* 250, *Edit.* 2.)

As warts are adventitious substances, and not any part of the original structure of the body, their powers of life are weak. Hence, when stimulated by particular applications, these excrescences generally become smaller and smaller, and, at length, altogether disappear, or drop off.

On this principle, warts may frequently be cured by stimulating them with a powder, composed of ærugo æris and savine leaves, in equal proportions.

However, the employment of escharotics; the removal of such excrescences with a knife or pair of scissars; or tying their necks with a ligature; is a mode frequently preferred, because the cure is sooner accomplished.

The two last methods are certainly particularly eligible, when the wart has a narrow neck; but, after the removal of the excrescence, it is still proper to touch the root with caustic; for, unless the whole be completely destroyed, the wart will inevitably grow again.

With respect to caustics, the practitioner may use the potassa cum calce vivâ, the argentum nitratum, or the sulphate of copper. I think a strong solution of the argentum nitratum is as efficacious an application of the caustic kind, as any, which can be used in these cases.

Warts on the pudenda, and about the anus, which are often erroneously supposed to be venereal, scarcely ever withstand the effect of the powder of savine, and ærugo æris.

WHITLOW. (*Panaris, Onychia, Panaritium, Paronychia.*) A whitlow is an inflammation, which occurs about the end of the finger, and is exceedingly painful, and very much disposed to suppurate. The affection is commonly seen attacking the fingers, but the toes are also sometimes the seat of the disease.

Writers usually divide whitlows into four kinds, or degrees.

The first one is the mildest. In this case, a vesicle, filled with matter, commonly arises near the root, or side of the nail, after a preceding superficial inflammation of trivial extent. The matter is situated immediately under the cuticle. Sometimes the abscess takes place under the nail, in which case, the pain is very severe, and not unfrequently shoots upward as far as the external condyle.

The second kind of whitlow is chiefly situated in the cellular substance under the cutis, and, for the most part, occurs at the very end of the finger. In this sort of case, the inflammatory symptoms, especially the pain, are far more violent, than they usually are in inflammations of such little extent. However, although the pain is thus severe, it does not in general extend far from the part affected, unless the tendon partake of the inflammation. Writers usually impute the violence of the pain, and the considerable degree of inflammation attending the complaint, to the hard and unyielding nature of the skin on the finger. To the same cause they also ascribe the difficulty of perceiving any fluctuation, after matter has been formed; and the slowness, with which the pus makes its way outward.

The third kind of whitlow is distinguishable from the others by the following circumstances. With the most excruciating pain, there is very little swelling in the affected finger, but, a vast deal in the hand, particularly, about the wrist, and over the whole fore-arm. The pain extends to the hand, wrist, elbow, and even the shoulder. When suppuration has taken place, a fluctuation can never be felt in the affected finger, though the undulation of matter may very often be distinctly perceived in the hand, at the wrist, or even somewhere in the fore-arm. The case is frequently accompanied with a considerable degree of fever. In this species of whitlow, the disease is seated in the tendons and their sheaths, and the power of moving the fingers, and even the whole hand, is lost.

Authors describe the fourth kind of whitlow, as arising principally from an inflammation of the periosteum. The case is attended with one peculiarity, which is, that, however violent the pain may be, it never extends to the hand, and fore-arm, nor is there any external swelling of the affected finger. Suppuration generally very soon follows, the usual consequence of which is a caries of the subjacent finger-bones.

Whitlows commonly begin on the inside of the fingers; but, they do occasionally commence on the back of these parts, and even on that of the hand. Though pain about the wrist is usually the effect of the inflammation in the finger, yet Acrel makes mention of a case, in which the disorder was altogether confined to the hand itself. (*Vorfälle*, 2 *B. p.* 191.)

Besides the above species of whitlows, Richter takes notice of a very painful affection of the finger, that has been termed the *dry* whitlow. Acrel relates, that a man, without any particular preceding cause was seized with a very violent darting pain, near the nail of the little finger. The pain sometimes ceased for a few minutes, or hours, and then recurred and lasted for weeks, and months.

At length, it became still more intolerable and unremitting, and extended all up the arm. Hence, the removal of the first painful portion of the finger was determined on. Nothing unnatural was found in the appearance of the integuments and tendons; but, the texture of the bone was quite destroyed, and changed into a fatty substance. (*Acrel, Vorfälle*, 2 *B. p.* 210.)

Mr. Wardrop has favoured the public with an account of a particular species of whitlow, which from its malignant character, he has denominated the *onychia maligna.* "The commencement of this disease is marked by a degree of swelling, of a deep red colour, in the soft parts at the root of the nail. An oozing of a thin ichor afterwards takes place at the cleft formed between the root of the nail and soft parts, and at last the soft parts begin to ulcerate. The ulcer appears on the circular edge of the soft parts at the root of the nail, it is accompanied with a good deal of swelling, and the skin, particularly that adjacent to the ulcer, has a deep purple colour. The appearance of the ulcer is very unhealthy, the edges being thin and acute, and its surface covered with a dull yellow, or brown coloured lymph, and attended with an ichorous and very fetid discharge. The growth of the nail is interrupted, it loses its natural colour, and at some places appears to have but little connexion with the soft parts. In this state (says Mr. Wardrop) I have seen the disease continue for several years, so that the toe, or finger, became a deformed bulbous mass. The pain is sometimes very acute; but, the disease is more commonly indolent, and accompanied with little uneasiness. This disease affects both the toes and the fingers. I have only observed it on the great toe, and more frequently on the thumb, than any of the fingers. It occurs, too, chiefly in young people; but, I have also seen adults affected with it." (*Wardrop in Med. and Chir. Trans. Vol.* 5, *p.* 135, 136.)

The causes of whitlows are generally of a local nature. Writers enumerate the following as the most common: a contusion; suddenly warming the finger when it is exceedingly cold; pricks with needles, or other sharp instruments; and the insinuation of irritating matter into scratches on the finger. A surgeon, in operating for a fistula in ano, has been known to cut his finger, and have in consequence of the accident a very severe and dangerous kind of whitlow. Richter also mentions a person, who had a most obstinate whitlow, in consequence of getting a slight wound on the finger, in examining the head of a horse, that had the glanders. Sometimes, the cause of a whitlow depends on a splinter, which still continues lodged in the part. Very often, no particular cause whatever can be assigned for the complaint.

The different kinds of whitlows are not all to be treated in the same manner.

The first case, which occurs about the root of the nail, ought to be opened as soon as possible. When this plan is not adopted, the matter not only makes its way round the nail, but penetrates more deeply, so as to reach the root of the nail, and occasion a loss of the part. When an effectual opening is not made, the matter is apt to collect again. In general, a detachment of the cuticle takes place, as far as the abscess extends. When the inflammation has been very violent, and the matter has made its way as far as the root of the nail, the nail itself is in general gradually detached, while the denuded portion of the root of the nail acts on the sore as a foreign body, and hinders it from healing. Hence, the surgeon should repeatedly cut away as much of the lower edge of the nail as he can, and insinuate a little soft lint between the margin of the nail and the sore, in order to keep the latter from being irritated by the former. In proportion as the old nail gradually separates, a new one makes its appearance.

When matter lies under the nail, an opening should be made through the part, as speedily as possible, for the discharge of the abscess. In order to perform this operation, Richter advises the surgeon to scrape, with a piece of glass, the part of the nail to be opened, till it is as thin as it can well be, and then to cut through it with the point of a bistoury.

In the second species of whitlow, suppuration may sometimes be prevented, and the inflammation be resolved, by the timely employment of proper means. When the pain is exceedingly violent, and there is acute fever, it may be advisable to bleed the patient in the arm. In a few severe cases, the application of three or four leeches to the affected finger has been known to procure prompt relief. (*Schmucker.*) Theden thinks, that applying a roller round the finger, hand, and arm, and frequently wetting the two first parts with a lotion, the most certain means of resolving the inflammation. Platner advises the finger to be for some time immersed in water, as warm as the patient can bear. Some recommend the external use of camphorated spirit, or the volatile alkali; while others advise the affected finger to be plunged into a very warm solution of soap, or kali. When the whitlow has been occasioned by a prick, particular care must be taken, that there is no extraneous substance remaining in the puncture.

When the symptoms do not lessen by the fourth day, Richter recommends making an opening in the finger. Even when no fluctuation is discovered, the same surgeon approves of making a crucial incision in the seat of the pain, and, he states, that although no matter may be discharged, the patient always derives infinite relief from the operation. The benefit, he says, may either be imputed to the bleeding, or to the division of the hard tense skin, which compresses the subjacent inflamed parts. Sometimes, the collection of matter can be plainly felt, and, in this case, there can be no hesitation about the place, where the opening should be made. However, it may be proper to remark, that the opening should always be made sufficiently large. When the surgeon makes a small puncture, it very soon closes again, and a repetition of the operation becomes necessary. When opening the abscess is delayed, the theca of the flexor tendons easily becomes affected, or the matter may make its way to a considerable extent around under the skin. Sometimes, the matter gets through the cutis, by ulceration, and elevates the cuticle, in the form of a pustule. In this case, as soon as the cuticle has been opened, a director should be introduced into the aperture in the skin, and the latter opening be enlarged with a bistoury.

The third species of whitlow seldom affects the last phalanx of the fingers; but, generally, the second, or third one. In this case, Richter enjoins us never to defer making an opening longer, than the third day. If we wait till suppuration happens, we shall wait till the tendons are destroyed, and the use of the finger lost. In the case under consideration, the matter is always of a bad quality, and very small in quantity. A fluctuation in the finger can very seldom be felt. However, in a very few instances, the matter becomes perceptible at the extremity of the finger, or about the finger-joints, but, more often, in the palm of the hand, or near the wrist. In these circumstances, the tendons are in general already destroyed, and a stiffness of the finger and hand is to be apprehended. When the complaint is the consequence of a puncture, the best plan, according to Richter, is at once to enlarge the wound; for, in this sort of case, all other methods are quite unavailing. It is not enough, however, to cut through the skin; the tendinous theca itself must be laid open.

When the pain does not undergo any diminution, after the tendinous sheath has been opened, or, should the pain, after subsiding, recur again, the first opening should be dilated by means of a knife and director. Also, if the patient should experience in any other part of the hand an acute pain, which does not diminish in consequence of this first opening; or if signs of the formation of matter should be observed elsewhere in the hand; an opening should be made there, of sufficient depth to reach through the theca of the flexor tendons. When a collection of matter forms towards the wrist, or the patient feels violent pain in that situation, an opening must also be made there. If an opening should have been already made in the hand, a probe may be introduced into the wound, and another aperture made in an eligible situation by cutting on the end of the instrument. In the same way, Richter advises making an opening in any part of the fore-arm, where great pain, or the symptoms of suppuration, indicate.

In the fourth kind of whitlow, early incisions, made down to the bone, are the most certain means of obviating the danger. When such incisions are not made early enough, suppuration takes place, and the bone becomes carious. The cut is to be made in the place, where the pain is most severe. When the first phalanx is affected, the incision may be made in front of the finger; but, when the second, or third, is the seat of the complaint, the opening had better be made on one side. However, in order that the opening may be at all useful, it is absolutely necessary to make it down to the bone. When the incision has been delayed too long, a small quantity of unhealthy matter is usually detected, and the bone is found to be carious. As an exfoliation can hardly be expected in this situation, it is best to remove the diseased piece of bone at once, which can generally be effected without difficulty. When the last phalanx alone is affected, the finger retains its form, with the exception of its end being a little shorter and flatter. When the disease, however, is situated in the third phalanx, Richter thinks it better to amputate the finger, than remove the diseased bone, as the finger, if left, would always remain stiff and unserviceable. (See *Anfangsgr. der Wundarzneykunst, vol.* 7.)

With regard to the treatment of the species of whitlow, named by Mr. Wardrop, *onychia maligna*, all local applications have in many instances proved quite ineffectual, and the part been amputated. The only local treatment, which Mr. Wardrop has ever seen relieve this complaint has been the evulsion of the nail, and afterwards the occasional application of escharotics to the ulcerated surface. I have myself seen a similar plan occasionally succeed, and the applications, which appeared to answer best were arsenical lotions, Plunket's caustic, or a very strong solution of the nitrate of silver. Nothing, however, will avail, till the nail is removed, and its total separation sometimes takes up a good deal of time, unless the patient submit to the great pain of having it cut away.

Mr. Wardrop tried with success the exhibition of mercury in four cases of the onychia maligna. The medicine was given in small doses at first, and afterwards increased, so as to affect the gums in about twelve or fourteen days. The sores in general soon assumed a healing appearance, when the system was in this state, and the bulbous swelling gradually disappeared. (See *Medical and Chir. Trans, Vol.* 5, *p.* 138.)

**WOUNDS.** A great deal of the subject of wounds has been already considered in the articles, *Gun-shot Wounds; Head, Injuries of; Hemorrhage; Hydrophobia; Parotid Duct; Sutures; Tetanus; Throat;* &c.

A wound may be defined to be a recent solution of continuity in the soft parts, suddenly occasioned by external causes, and generally attended at first with a greater or lesser degree of hemorrhage.

Wounds in general are subject to considerable variety in their nature, degree of danger, facility of cure, and the consequences, which are to be apprehended from them. Some wounds are perfectly trivial, not extending more deeply, than the skin and cellular membrane; while others are more serious, penetrating the muscles, tendons, large blood-vessels, and nerves of importance. There are also certain wounds, which are not confined to the soft parts, but injure even the bones: such are many sabre-wounds, which frequently separate at once both a portion of the scalp and the subjacent part of the skull. Many wounds of the head, chest, and abdomen injure the organs, which are contained in those cavities. In short the varieties, and the degree of danger, attending wounds in general, depend very much upon some of the following circumstances. The extent of the injury; the kind of instrument with which it has been inflicted; the violence, which the fibres of the part have suffered, in addition to their division; the size and importance of the blood-vessels and nerves, which happen to be injured; the nature of the wounded part, in respect to its general power of healing favourably, or not; whether the operations of the system at large, and life itself, can be well supported, or not, while the functions of the wounded part are disturbed, interrupted, or suspended, by the accident; the youth, or old age of the patient; the goodness, or badness of his constitution; and the opportunities, which there may be of administering proper surgical aid, and assistance of every kind

Wounds are distinguished by surgical writers into several kinds; viz. *incised, punctured, contused, lacerated, poisoned,* and *gun-shot wounds.* They also make another equally important division of these cases into *Wounds of the Head, Thorax* and *Abdomen.*

Of gun-shot wounds, and wounds of the head, an account has already been given. (See *Gun-shot Wounds,* and *Head, Injuries of.*) The other cases I shall now proceed to consider.

### INCISED WOUNDS.

As a general observation, we may state, that, *cæteris paribus*, a wound, which is made with a sharp cutting instrument, which is, in short, a mere incision, is attended with less hazard of dangerous consequences, than any other kind of wound whatever. The fibres have only been simply divided; they have suffered no contusion, nor laceration; they are consequently less likely to inflame so considerably as to suppurate, or slough; and they commonly admit of being united again in a very expeditious manner.

Simple incised wounds for the most part bleed more freely, than contused and lacerated ones, which at first frequently emit no blood at all, although considerable blood-vessels may be injured. But, this circumstance, apparently diminishing the danger of contused and lacerated wounds, is deceitful, and serves rather to render the case in reality more perilous, by inducing the inexperienced practitioner to be off his guard against hemorrhage. Certainly, it often happens, that, on the immediate occurrence of such wounds, there is no bleeding of consequence. However, the side of some large artery having suffered great violence at the time of the accident, it may ulcerate, or slough, a week or ten days afterwards, and an alarming, and even fatal effusion of blood be the result.

This unpleasant occurrence of sudden hemorrhage is particularly apt to occur in cases of gun-shot wounds, which are injuries always attended with a considerable degree of contusion and laceration.

In cases of simple incised wounds, the bleeding, which at once takes place from all the divided vessels, is a source of very useful information to the surgeon, inasmuch as it enables him to judge, what danger is to be apprehended from the hemorrhage, whether the cut vessels are large enough to demand the ligature, or, on the contrary, whether they are such as will cease to bleed, either by slight pressure, or of their own accord.

A surgeon, called to a recent simple incised wound, has three objects which he should endeavour to accomplish, without the least delay. The first, and that which requires his immediate interference, is the bleeding, which must be checked. The second is the removal of all extraneous matter from the surface of the wound. The third object is to unite the opposite sides of the injury.

When the divided vessels are not above a certain size, the bleeding soon spontaneously ceases, and no surgical measures need be taken on this particular account. When the wounded vessels are even somewhat larger, and their situation is favourable for compression with a bandage, it is often advisable to close the wound and apply compresses and a roller, rather than have recourse to ligatures, which always create a certain degree of suppuration. However, though I have made this observation, I should be exceedingly sorry to appear at all against the general preference to ligatures, whenever the wounded arteries are above a certain magnitude. In this circumstance, tying the bleeding vessels is the only safe mode of proceeding. When the artery is of considerable size, and its mouth can be readily seen, the most proper instrument for taking hold of it is a pair of forceps. In applying the ligature, the surgeon must take care to pull its ends in such a manner, that the noose will not rise above the mouth of the vessel, and for the purpose of altering the direction of the force employed in tightening the ligature, the ends of the thumbs are generally made use of. The tenaculum is commonly employed for taking up arteries, which are not exceedingly large and distinct.

Very fine ligatures, of sufficient strength, are at present often applied as well to large as small vessels. One half of each ligature should always be cut off, before the wound is closed, and there are some surgeons, who prefer the method of cutting off all the ligature, except what forms the noose immediately round the artery. (*Delpech, Mém. sur la Pourriture d'Hôpital, p.* 29; *Lawrence in Med. Chir. Trans. Vol.* 6, *p.* 156.) To the latter plan, however, a few surgeons have adduced objections, particularly Mr. Guthrie, who only admits the utility of it in cases, where the wound will not unite by the first intention; (*On Gun-shot Wounds, p.* 94,) and Mr. Cross, of Norwich. (See *the London Medical Repository, Vol.* 7, *p.* 353.) The experiments of Mr. Cross tend to the following conclusions:

First; If the wounds do not unite by the first intention, the ligatures may escape with the discharge, without any inconvenience.

Secondly; If common ligatures of twine are cut short, the wound may unite over them, and they may be found in abscesses after an interval of many weeks.

Thirdly; If the finest dentist's silk be employed in the same way, the wound uniting over it, the ligature may be detached from the vessel, and remain buried in an abscess, where it will be found at different periods, from one to seven months; and this may happen, whether the vessel be firmly compressed with a single ligature, or divided between two ligatures, so as to imitate the circumstances, under which vessels are tied after operations.

Fourthly; If Indian silk, fine as hair, be put round a vessel, so as to diminish its diameter, or to effect its obliteration, by just compressing its sides together, it may remain in this situation, without exciting abscess, or producing any inconvenience. The ligature may be thus applied to compress an artery for the cure of aneurism; but, not to secure vessels divided in operations. If a thin ligature be drawn sufficiently tight upon a vessel on the face of a stump to be secure, Mr. Cross is persuaded, that the extremity of the vessel, which becomes insulated, as it were, must die. (See *London Medical Repository, Vol.* 7, *p.* 363.) It deserves attention, that the preceding inferences are chiefly founded on experiments made upon asses and dogs.

In the meanwhile, it also merits notice, that the practice continues to be adopted at St. Bartholomew's Hospital to a very great extent, and no ill consequences are remarked from it. It was only the other day, that my friend Mr. Lawrence informed me, he had never seen any inconvenience from the method, except in one solitary instance. In this case, one of the arteries of the wrist had been tied with a fine ligature, which was cut off close to the knot. The wound healed very well; but, there remained afterwards a small, indolent, lump, which caused no particular annoyance, and from the little swelling a minute portion of ligature was either discharged, or extracted, I forget which.

However, I need not expatiate on the mode of tying arteries, as the subject is fully considered in other parts of this Dictionary. See *Aneurism, Hemorrhage, Ligature, Surgery,* &c.

The bleeding having been suppressed, the next object is to remove any extraneous matter, such as dirt, bits of glass, clots of blood, &c. from the surface of the wound. Were this circumstance neglected, the plan of uniting the opposite sides of the cut by the adhesive inflammation, or by what is more frequently termed, union by the first intention, would in general be frustrated.

As soon as the foregoing indications have been attended to, the surgeon must approximate the lips of the wound, put them in contact, and take proper precautions for keeping them in this state, until they have firmly grown together. The sides of incised wounds are kept in a state of apposition by the aid of adhesive plaster, a proper position, the pressure of a roller, and, in a few particular instances, by the employment of sutures.

With respect to sutures, as they create pain and irritation, they ought never to be employed when the parts can be kept in contact without them. Certain cases, however, require them, and it is admitted by every experienced surgeon, that in sabre-wounds of the ears, eyelids, nose, and lips, it is proper to use them. (See *Assalini's Manuale di Chirurgia, Parte Seconda, p.* 10.) An account of the several kinds of sutures, with remarks on their employment, will be found in the article *Sutures.*

The best and most common method of keeping the surfaces of divided parts in contact is by means of strips of adhesive plaster. At the time, when they are to be applied, the surgeon should put the wounded parts in such a position, as shall render them capable of being brought into a state of apposition with most facility. With this view, a position should generally be chosen, which relaxes the skin and subjacent muscles. An assistant should then place the edges of the wound as evenly together as possible, and hold them in this state, until the surgeon has secured them in this condition by strips of adhesive plaster, applied across the line of the wound. In general, it is deemed advisable to leave a small interspace of about a quarter of an inch between each two strips of plaster, by which means the matter cannot be confined in case of suppuration. Over these first strips, lint is to be applied, and kept in its place with other pieces of adhesive plaster. Then, if necessary, a pledget and compresses are to be put on the part, and, lastly, the bandage, or roller, is to be applied.

In this manner, the fresh-cut surfaces are brought into contact, and to preserve them quietly in this state, is the next great aim, which the surgeon should have in view. The wounded part should be laid in the posture, which was found the most favourable for approximating the sides of the cut, at the time of applying the dressings, and the patient should be directed to keep the part in a perfectly quiet state.

When attention is paid to these circumstances, it often happens, that the two opposite surfaces of the wound grow together again in the course of forty-eight hours, without the occurrence of the least degree of suppuration. The process, by which this desirable event is accomplished, is well known among surgeons, by the name of *union by the first intention.* Besides the advantage of the cure being effected in this way with the greatest expedition possible, there is still another thing much in favour of constantly promoting this method of healing wounds, which is, that the scar is much less, than after any other plan, and the part is covered with original skin, which is always much stronger, than any which can be formed as a substitute for it.

It is wonderful, with what celerity union by the first intention takes place under favourable circumstances. In the course of three days, the large wound, made in the operation of amputation, is frequently all healed, except just where the ligatures are situated.

When the two sides of the wound have been brought together, before the oozing of blood has entirely ceased, Mr. Hunter conceives, that blood itself becomes the first bond of union; but, on this point, Professor Thomson, of Edinburgh, entertains a doubt; and all practical surgeons agree, that the presence of blood is more likely to prevent, than promote, the union of the parts. In other instances, what Mr. Hunter called the adhesive inflammation occurs. In this process, coagulating lymph either issues from the half-closed mouths of the vessels, or from the surface of the opened cells of the cellular substance. This becomes the first uniting medium, and, very soon afterwards, in some inexplicable manner, a vascular intercourse is established between the opposite sides of the wound.

The power, which parts of the animal body have, of growing together in the above manner, is strikingly evinced by the possibility of removing a part of one body, and then uniting it to some part of another. In this latter case, there can be no assistance given to the union on one side, since the detached part, as Mr. Hunter observes, can hardly do more, than just preserve its own living principle, and accept of union. In this way, says the same writer, the spurs of the young cock can be made to grow on his comb, or on that of another cock; and its testicles, after having been removed, may be made to unite to the inside of any cavity of an animal.

Every one initiated in surgery has heard of the feats of Taliacotius, Garengeot, and others, who are said to have succeeded in effecting the union of parts, which were completely severed from the body. Several other not less extraordinary performances by modern surgeons have come to my ears. Indeed, the well-known practice of transplanting the teeth; the experiments of Duhamel and Hunter; and the number and respectable character of the testimonies upon this subject, fully convince me of the occasional success, which may attend the endeavour to bring about such an union. Experience also fully proves the frequent success, which attends an endeavour to unite a part, which retains only the slight connexion of a small piece of flesh, or even a few fibres. My friend, Mr. Lawrence, lately had a case, which illustrates the truth of this statement. A man, on the top of a stage coach, was carried under a gateway, which did not leave sufficient room for him to pass without injury, and his head was so much wounded, that one of his ears was entirely separated, with exception of an attachment by a trivial piece of integuments. Mr. Lawrence assented to the man's wish of not having the separation completed, and fixed the part in its situation with a few sutures. The consequence was that the ear soon united again, and the patient escaped all disfigurement.

Mr. John Bell describes the process of adhesion to be this: either the arteries of the opposite surfaces inosculate mouth to mouth, or rather each cut-surface throws out a gluten; the gluten fills up the intermediate space; into that gluten, the lesser arteries of each cut-surface extend themselves, and it is thus, perhaps, by the generation of a new intermediate substance, that the continuity and entireness of the part are so quickly restored. If any one point fail to adhere, there the wound must run into suppuration; because, says Mr. J. Bell, at that point there is a separation of parts, which is equivalent to a loss of substance.

The same writer observes, that there are, no doubt, accidents, both of the constitution and the wound, which will prevent adhesion. If the patient be of a bad habit of body; if he be lying in a foul hospital, in the midst of putrid sores, and breathing a contagious air; if he be ill of a fever, or flux, or any general disease; then the properties of the body being less perfect, the wound will not adhere. Mr. J. Bell also notices, that, if the wound be foul, made with a poisoned weapon, or left with foreign bodies lodged in it; or if a considerable quantity of blood be poured out into the cavity of the wound; or if there be a wounded lymphatic, or a wounded salivary duct, a wounded intestine, or a bleeding artery or vein, the immediate adhesion of the whole of the wound may be prevented. However, I cannot help remarking, that, though Mr. John Bell, in imitation of most surgical writers, sets down the wound of a lymphatic, as preventive of the union of wounds, I cannot say, that I ever saw such an effect imputable to the cause just mentioned. Also, when an artery, or vein is cut, and requires being tied, the adhesion of the wound would only be prevented just where the ligature lies.

There is no wound, observes Mr. John Bell, in which we may not try with perfect safety to procure this adhesion; for, nothing can agree better with one surface of the wound, than the opposite one, which has been just separated from it. They may immediately adhere together, and even if they should not do so, no harm is done, and the wound will yet suppurate as favourably, as if it had been roughly dressed with dry caddis, or some vulnerary balsam, or acrid ointment. If one part should suppurate, while one half adheres, then, says Mr. John Bell, one half of our business is done. In short, this simple duty of immediately closing a wound is both natural and safe. (*Discourses on the Nature and Cure of Wounds, Vol.* 1.)

Upon this interesting topic of the advantages of union by the first intention, the most enlightened surgeons of all Europe now begin to entertain only one opinion. The practice is generally adopted both in the treatment of accidental cuts, and of the wounds resulting from surgical operations. Thus Assalini, one of the best modern surgeons in Italy, begins his Manual of Surgery with the following axiom: "Wounds and injuries of the soft parts, produced by cutting instruments, from the trifling wound of a vein, made for the purpose of discharging a few ounces of blood, to the incision in the uterus for the extraction of the fœtus, inclusively, should all be united by the first intention." (See *Manuale di Chirurgia del C. Assalini; Discorso Primo. Milano*, 1812.)

British surgeons have, indeed, been accused by M. Roux of indiscriminate partiality to the plan of uniting all incised wounds by the first intention, and his countryman M. Larrey has wished the method to be discontinued after amputation, in order (as he states) to lessen the chance of tetanus. But, the exceptions, which these surgeons wish to make, are few, and few as they are, they are not likely to be established, since several of the circumstances, alleged as reasons for limiting so beneficial a practice, are hypothetical, and far from being clearly proved.

Sometimes, the attempt to procure an union by the first intention fails, even in cases of incised wounds; but, in this circumstance, no harm arises from the kind of practice, which has been followed. The case, in fact, now falls into nearly the same state, as would have occurred, had no attempt at union been made at all. The patient has taken the chance of a quicker mode of cure; but, he has not been successful, and he must now be cured by a process, which on account of its slowness he at first wished to avoid. It is to be observed, also, that union by the first intention, if not spoiled by sutures, rarely fails so completely, that there is not a partial adhesion of some points of the wound. The moment, when we observe pain, inflammation, and swelling of the wound, a separation or gaping of its lips, the stitches tense (when these have been used), and the points, where the stitches pass, particularly inflamed, Mr. John Bell advises us to undo the bandages, draw out the sutures, and take away every thing, which acts like a stricture on the wound. These prudent measures, he observes, may abate the rising inflammation, and prevent the total separation of the skin, while an endeavour may still be made to keep the edges of the wound tolerably near each other by the more gentle operation of sticking-plasters.

However, when the inflammation rises still higher, and it is evident that a total separation of the sides of the wound cannot be avoided, the above author recommends leaving the parts quite loose, and applying a large soft poultice; for, says Mr. John Bell, should you, in this critical juncture, persist in keeping the parts together with sutures, the inflammation, in the form of erysipelas, would extend over the whole limb, attended with a fetid and bloody suppuration. After the wound has got into a favourable state, another attempt may now be made to bring the edges near each other, not with sutures, but, strips of adhesive plaster, or the gentle application of a bandage.

Mr. John Bell concludes with remarking, that the suppuration, production of granulations, and all that follows, are the work of nature. The only thing, that the surgeon can usefully do, is to take care of the health. When the wound does not suppurate favourably, the discharge generally becomes profuse, thin and gleety. This state is to be amended by bark, wine, rich diet, and good air.

I shall conclude this subject of union by the first intention with an extract from the writings of Mr. Hunter, who observes that

" It is with a view to this principle of union, that it has been recommended to bring the sides (or lips) of wounds together; but as the natural elasticity of the parts makes them recede, it has been found necessary to employ art for that purpose. This necessity first suggested the practice of sewing wounds, and afterwards gave rise to various inventions in order to answer this end, such as bandages, sticking-plasters, and ligatures. Among these, the bandage commonly called the uniting bandage is preferable to all the rest, where it can be employed; but its application is very confined, from being only adapted to parts where a roller can be used. A piece of sticking-plaster, which has been called the dry suture, is more general in its application than the uniting bandage, and is therefore preferable to it on many occasions.

" I can hardly suppose (says Mr. Hunter) a wound, in any situation, where it may not be applied, excepting penetrating wounds, where we wish the inner portion of the wound to be closed equally with the outer, as in the case of hare-lip. But even in such wounds, if the parts are thick, and the wound not large, the sides will seldom recede so far as to make any other means necessary. The dry suture has an advantage over stitches, by bringing a larger surface of the wound together, by not inflaming the parts to which it is applied, and by neither producing in them suppuration nor ulceration, which stitches always do. When parts, therefore, can be brought together, and especially where some force is required for that purpose, from the skin not being in large quantity, the sticking-plaster is certainly the best application. This happens frequently to be the case after the removal of tumours, in amputation, or where the sides of the wound are only to be brought together at one end, as in the hare-lip; and I think the difference between Mr. Sharp's cross-stitch, after amputation, as recommended in his Critical Enquiry, and Mr. Allanson's practice, shews strongly the superiority of the sticking-plaster (or dry suture). In those parts of the body where the skin recedes more than in others, this treatment becomes most necessary; and as the scalp probably recedes as little as any, it is therefore seldom necessary to apply any thing in wounds of that part; the practice will certainly answer best in superficial wounds, because the bottom is in these more within its influence.

"The sticking plasters should be laid on in strips, and these should be at small distances from each other, viz. about a quarter of an inch at most, if the part requires close confinement; but when it does not, they may be at greater distances. This precaution becomes more necessary if the bleeding is not quite stopped; there should be passages left for the exit of blood, as its accumulation might prevent the union, although this does not always happen. If any extraneous body, such as a ligature, should have been left in the wound, suppuration will take place, and the matter should be allowed to vent at some of those openings, or spaces, between the slips of plaster. I have known a very considerable abscess formed in consequence of this precaution being neglected, by which the whole of the recently united parts has been separated.

"The interrupted suture, which has generally been recommended in large wounds, is still in use, but seldom proves equal to the intention. This we may reckon to be the only one that deserves the name of suture; it was formerly used, but is now in a great measure laid aside in practice, not from the impropriety of uniting parts by this process, but from the ineffectual mode of attempting it. In what manner better methods could be contrived, I have not been able to suggest. It is to be understood, that the above methods of bringing wounded parts together, in order to unite them, are only to be put in practice in such cases as will admit of it; for if there was a method known, which in all cases would bring the wounded surfaces into contact, it would, in many instances, be improper, as some wounds are attended with contusion, by which the parts have been more or less deadened; in such cases, as was formerly observed, union cannot take place according to our first principle, and therefore it is improper to attempt it.

"In many wounds, which are not attended with contusion, when we either know, or suspect, that extraneous bodies have been introduced into the wound, union by the first intention should not be attempted, but they should be allowed to suppurate, in order that the extraneous matter may be expelled. Wounds, which are attended with laceration, although free from contusion, cannot always be united by the first intention, because it must frequently be impossible to bring the external parts, or skin, so much in contact, as to prevent that inflammation which is naturally produced by exposure. But even in cases of simple laceration, where the external influence is but slight, or can be prevented (as we observed in treating of the compound simple fracture) we find that union by the first intention often takes place; the blood, which fills up the interstices of the lacerated parts, having prevented the stimulus of imperfection in them, and prevented suppuration, may afterwards be absorbed.

"Many operations may be so performed as to admit of parts uniting by the first intention; but the practice should be adopted with great circumspection: the mode of operating with that view, should in all cases be a secondary, and not a first consideration, which it has unluckily been too often among surgeons. In cases of cancer, it is a most dangerous attempt at refinement in surgery.

"In the union of wounded parts by the first intention, it is hardly or never possible, to bring them so close together at the exposed edges, as to unite them perfectly by these means; such edges are therefore obliged to take another method of healing. If kept moist, they will inflame as deep between the cut surfaces as the blood fails in the union, and there suppurate and granulate; but if the blood be allowed to dry and form a scab between, and along the cut edges, then inflammation and suppuration of those edges will be prevented, and this will complete the union, as will be described by-and-by.

"As those effects of accidental injury, which can be cured by the first intention, call up none of the powers of the constitution to assist in the reparation, it is not the least affected or disturbed by them; the parts are united by the extravasated blood alone, which was thrown out by the injury, either from the divided vessels, or in consequence of inflammation, without a single action taking place, even in the part itself, except the closing or inosculation of the vessels; for the flowing of the blood is to be considered as entirely mechanical. Even in cases where a small degree of inflammation comes on, it is merely a local action, and so inconsiderable, that the constitution is not affected by it; because it is an operation to which the powers belonging to the parts themselves are fully equal. The inflammation may produce a small degree of pain, but the operation of union gives no sensation of any kind whatever." (*Hunter on the Blood, Inflammation, and Gun-shot Wounds.*)

### CONTUSED AND LACERATED WOUNDS.

*Lacerated* wounds are those, in which the fibres, instead of being divided by a cutting instrument, have been torn asunder by some violence, capable of overcoming their force of adhesion. The edges of such wounds, instead of being straight and regular, are jagged and unequal.

The term *contused* is applied to those wounds, which are occasioned by some blunt instrument, or surface, which has violently struck a part of the body.

These two species of wounds greatly resemble each other, and as they require nearly the same kind of treatment, writers usually treat of them together.

Lacerated, and contused, wounds differ from simple incised ones in appearing, at first view, much less alarming, than the latter, while, in reality, they are infinitely more dangerous. In simple cut wounds, the retraction of the parts, and the hemorrhage, are generally much more considerable, than in a lacerated wound of the same size. However, notwithstanding these circumstances, they commonly admit of being healed with by far the greatest ease. It is worthy of particular notice, that lacerated and contused wounds are not in general attended with any serious effusion of blood, even though large blood-vessels may be injured. I say, in general, because in the year 1813, I saw a soldier, whose death was occasioned by a sudden effusion of a very large quantity of blood from the internal jugular vein, which vessel had been injured by a musket-ball, that first entered the integuments behind the mastoid process, and passed obliquely downwards and forwards towards the sternum. The blood did not issue externally; but, formed betwixt the integuments and the trachea, a large dark-coloured swelling, which produced almost immediate suffocation. At the memorable siege of Saragossa, Professor Assalini saw a surgeon, whose left carotid artery had been injured by a musket-ball, perish of hemorrhage in a few seconds. (See *Assalini's Manuale di Chirurgia, p.* 32, *Milano,* 1812.)

In most cases, however, there is little, or no hemorrhage from lacerated and contused wounds, and it is a circumstance, which often leads inexperienced practitioners to commit great mistakes, by inducing them to promise too much in the prognosis, which they make. Surgeons versed in practice, however, do not allow themselves to be deceived by the absence of hemorrhage, and, in proportion as there is little bleeding, they apprehend that the violence, done to the fibres and vessels has been considerable. What is it, but the contused and lacerated nature of the wound, that prevents hemorrhage from the umbilical arteries, when animals divide the navel-string with their teeth? Whole limbs have frequently been torn from the body, without any hemorrhage of consequence taking place.

Cheselden has described, in the Philosophical Transactions, a very remarkable case, in which a man's arm was suddenly torn from his body. Samuel Wood, a miller, had round his arm a rope, which got entangled with the wheel of a mill. He was lifted off the ground, and then stopped by a beam, which prevented his trunk from passing further; at this instant, the wheel, which was moving with immense force, completely tore, and carried away, his arm and scapula from his body. The appearance of a wound, occasioned in this manner, must of course be horrible, and the first idea, thence arising, must naturally be that the patient cannot possibly survive. Samuel Wood, however, escaped with his life. The limb had been torn off with such velocity, that he was unaware of the accident, till he saw his arm moving round on the wheel. He immediately descended by a narrow ladder from the mill, and even walked some paces, with a view of seeking assistance. He now fell down from weakness. The persons who first came to his assistance, covered the wound with powdered sugar. A surgeon, who afterwards arrived, observing that there was no hemorrhage, was content with bringing down the skin, which was very loose, so as to make it cover the surface of the wound. For this purpose, he used two cross-stitches. The patient was conveyed, the next day, to St. Thomas's Hospital, and put under the care of Mr. Fern, who was then the head surgeon of that charity. This practitioner employed the means usually resorted to, with a view of preventing the bad symptoms to be apprehended in this sort of case. The first dressings came away without any bleeding; no alarming consequences ensued; and the patient got completely well in the course of a couple of months.

When the arm was examined, it was found, that the muscles, inserted into the scapula, were torn through near their insertions; while other muscles, arising from this bone, were carried away with it. The skin, covering the scapula, had remained in its natural situation, and seemed as if it had been divided precisely at the insertion of the deltoid muscle.

In La Motte's *Traité des Accouchemens,* may be found an account of a little boy, who, while playing near the wheel of a mill, got his hand, fore-arm, and arm, successively entangled in the machinery, and the limb was violently torn away at the shoulder joint, in consequence of the lad's body not being able to pass in the direction, in which the arm was drawn. The bleeding was so trivial, that it was stopped with a little lint, and the boy very soon recovered.

In the fifth volume of the Edinburgh Medical Commentaries, may also be perused the history of a child, three years and a half old, which had its arm torn off by the wheel of a mill. Mr. Carmichael, who saw the child about an hour after the accident, found it almost in a dying state, with cold extremities, small faultering pulse, and all the right side of the body convulsed. However, there had been hardly any bleeding. The arm had been broken about an inch and a half above the elbow; the stump had a very dreadful appearance; all the soft parts were in a contused and lacerated state, and the humerus was laid bare as high as the articulation, which was itself exposed. The skin and muscles were lacerated to a much greater extent, and in different directions. The remainder of the humerus was removed from the shoulder-joint by amputation, only as much skin and muscle being left, as was sufficient to cover the wound. The child got completely well in two months.

In the second volume of the *Mémoires de l'Académie de Chirurgie*, is an account of a leg being torn away at the knee-joint by a cart-wheel. The patient was a boy, about nine or ten years of age. This accident, like the foregoing ones, was accompanied with no hemorrhage. The lower portion of the os femoris, which was exposed, was amputated, together with such portion of the soft parts, as was in a contused and lacerated state. The patient experienced a perfect recovery.

The preceding cases strikingly confirm the observation, which I have already made, in regard to the little bleeding, which usually arises from contused and lacerated wounds.

In these instances, the pain is also in an inverse ratio to the cause of the accident: it is generally very severe, when the wound is only moderately contused; and, on the other hand, the patient scarcely suffers any pain at all, where there has been so violent a degree of contusion, as at once to destroy the organization of the nerves of the part.

When the bruised fibres have not been exceedingly injured, the part suppurates; but, such portions of the wound, as have suffered greater violence, inevitably die, and are cast off in the form of sloughs. Granulations are afterwards formed, and the breach of continuity is repaired by the process of cicatrization. (See *this word.*)

When a still greater degree of violence has been done to the parts, and, especially, when arteries of a certain magnitude have been injured, a mortification is too frequently the consequence. However, if the constitution is good, and the mischief is not too extensive, the case may still end well. But, in other instances, the event is always alarmingly dubious; for, the mischief is then not limited to the wounded parts, which have suffered the greatest degree of contusion; but, too frequently extends over such parts, as were not at all interested by the wound itself.

The mortification, arising directly from the impaired organization of parts, is not what is the most alarming circumstance. The most dangerous kind of mortification is that, which is apt to originate from the violent inflammation, occasioned by the accident. This consequence demands the utmost attention on the part of the surgeon, who must let no useful means be neglected, with a view of diminishing the inflammation, before it has attained so high a pitch, as to induce fatal effects. He should not be afraid of letting the wound bleed a little, if it should be disposed to do so in the first instance. The edges of the wound should then be approximated with a few strips of sticking-plaster, so as to lessen the extent of the exposed surface: but, no sutures are proper. Indeed, the plan of diminishing the exposed surface of a contused wound with strips of adhesive plaster is not invariably right; because their application creates a degree of irritation, which proves hurtful. The method is chiefly advisable, when there is a large loose flap of skin, which can be conveniently brought over the wound. In other cases, it is best to leave the parts free, uncompressed, and unconfined with any adhesive plaster, because, if it were applied, its irritation would do harm, and could not possibly procure any union of the parts. Under the most favourable circumstances, hardly any part of the wound can be expected to unite by the first intention; the whole, or the greater part of it will necessarily suppurate, after the detachment of the sloughs. The surface will then granulate, new skin will form, and the part heal just like a common wound. Perhaps, until the sloughs have separated, the best application is a soft poultice, which should be put on cold, lest it bring on too great an oozing of blood.

Nothing, indeed, is so proper for checking any tendency to hemorrhage as cold applications, which are also the most effectual in preventing and diminishing the great degree of inflammation, which is one of the most dangerous consequences of this description of wounds.

No surgical writer, I think, has given more rational advice respecting contused wounds, than that published by Professor Assalini. In general, says he, the treatment of contused wounds, whether these be simple and slight, or complicated and severe, requires the active employment of debilitating means, in order to prevent inflammation. Cold water, and ice; and general and topical bleeding; are the things usually resorted to with success. Vulnerary lotions, camphorated spirit, and other spirituous applications, are improper, and if their pernicious effects are not always very evident, it is only because the contused injuries have been trifling, and in their nature perfectly easy of cure. In these cases, as well as in those of extravasations and glandular swellings, Assalini gives a preference to cold applications. The internal remedies and regimen, (says he) should also be adapted to the condition of the patient. A cannon-ball, at the end of its course, may come into contact with a limb, and fracture the bones, while the integuments have the appearance of being uninjured. Such cases are often attended with dreadful mischief in the soft parts around the bone, which generally sphacelate. This is an accident for which immediate amputation is mostly indispensable (see *Gun-shot wounds*); but if any thing be capable of preventing inflammation and gangrene, it is an active debilitating plan of treatment, assisted with cold applications to the injured part. The internal and external use of stimulants is in such cases approved of by many surgeons. But, Assalini prefers considering the state of the injured limb, just like what it is when affected with frost; and he thinks that the employment of stimulants will necessarily produce the same effect as caloric prematurely applied to parts deadened with cold. On the contrary, from the outward employment of ice and cold lotions in these cases, and in contused injuries in general, he has seen the greatest benefit derived.

Assalini conceives, that reason will be found to support this practice. The operation of cold, he says, retards the course of the blood, which meeting with only damaged vessels, augments the extravasation as it continues to flow. By lessening the temperature of the part, cold applications likewise diminish the danger of inflammation and sphacelus, at the same time that they have the good effect of making the suppuration, which must ensue, less profuse, than it would be, had not the extravasation of blood, and violence of the inflammation, been lessened by such cold applications, and a lowering plan of treatment.

Why, says Assalini, should not this method, which is so generally adopted to prevent the effects of concussion of the brain after blows on the head, be for analogous reasons employed in examples of extravasation and commotion in other parts of the body? (See *Assalini's Manuale di Chirurgia, Parte Prima*, p. 17.) Cold applications, however, in cases of contused wounds, are chiefly to be preferred, for the first day or two, in order to check the increase of extravasation, and inflammation. After this period, I give a decided preference to an emollient linseed poultice, which will be found the most easy dressing during those processes, by which the sloughs are detached, the surface of the wound cleansed, and the origin of granulations established. When these changes have happened, the remaining sore is to be treated on the same principles as ulcers in general. See *Ulcer*.

### PUNCTURED WOUNDS.

A *punctured* wound signifies one, that is made with a narrow-pointed instrument, the external orifice of the injury being small and contracted, instead of being of a size proportionate to its depth. A wound, produced by the thrust of a sword, or bayonet, affords us an example of a punctured wound.

Wounds of this description are in general infinitely more dangerous, than incised ones, notwithstanding the latter have the appearance of being by far the most extensive. The greatest degree of danger, in cases of punctured wounds, always depends on the additional injury, and rough violence, which the fibres have suffered, besides being divided. Some of the disagreeable consequences, apt to follow, are also to be imputed to the frequent great depth, to which punctured wounds are liable to extend, in consequence of which circumstance, important parts and organs are often injured. These cases are likewise less easy of cure, owing to the difficulty of extracting any extraneous substances, which may happen to be lodged in the wound. All punctured wounds, and stabs are at the same time dangerous, inasmuch as they are particularly liable to be followed by a great deal of inflammation, fever, deep-seated abscesses, sinuses, &c.

A strange notion seems to pervade the writings of many systematic authors, that all the danger and disagreeable consequences of punctured wounds are entirely owing to the narrowness of the orifice, which prevents suitable applications to the bottom of such wounds. Hence, it is absurdly recommended to dilate the opening of every stab, with a view, as is generally added, of converting the accident into a simple incised wound. Some of these writers are advocates for making the dilatation with a cutting instrument, while others, with equal absurdity, advise enlarging the opening with tents.

Certain authors regard a punctured wound, as a recent sinus, and, in order to make the inner surfaces unite, they recommend exciting a degree of inflammation in them, either by means of setons, or injections.

In the earliest edition of *The First Lines of the Practice of Surgery*, I have taken particular pains to expose the folly and error, which prevail in most writings on this part of practice. In the above work, I have remarked, that, certainly, if the notion were true, that an important punctured wound, such as the stab of a bayonet, is actually changed into a wound partaking of the mild nature of an incision, by the mere enlargement of its orifice, the corresponding practice would be highly commendable, however painful it might be. But the fact is otherwise; the rough violence done to the fibres of the body by the generality of stabs, is little likely to be suddenly removed by an enlargement of the wound. Nor can the distance, to which a punctured wound frequently penetrates, and the number and nature of the parts injured by it, be at all altered by such a proceeding. These, which are the grand causes of the collections of matter that often take place in the cases under consideration, must exist, whether the mouth and canal of the wound be enlarged or not. The time when incisions are proper, is, when there are foreign bodies to be removed, abscesses to be opened, or sinuses to be divided. To make painful incisions sooner than they can answer any end, is both injudicious and hurtful. They are sometimes rendered quite unnecessary, by the union of the wound throughout its whole extent, without any suppuration at all.

Making a free incision in the early stage of these cases, undoubtedly seems a reasonable method of preventing the formation of sinuses, by preventing the confinement of matter, and, were sinuses an inevitable consequence of all punctured wounds, for which no incisions had been practised at the moment of their occurrence, it would undoubtedly be unpardonable to omit them. Fair, however, as this reason may appear, it is only superficially plausible, and a small degree of reflection soon discovers its want of real solidity. Under what circumstances do sinuses form? Do they not form only where there is some cause existing to prevent the healing of an abscess? This cause may either be the indirect way, in which the abscess communicates externally, so that the pus does not readily escape; or it may be the presence of some foreign body, or carious bone; or, lastly, it may be an indisposition of the inner surface of the abscess, to form granulations, arising from its long duration, but removeable by laying the cyst completely open to the influence of the air. Thus it becomes manifest, that the occurrence of suppuration in punctured wounds, is only followed by sinuses in cases, in which the surgeon neglects to procure a free issue for the matter, after its accumulation; or in which he neglects to remove any extraneous bodies. But, as dilating the wound at first can only tend to augment the inflammation, and render the suppuration more extensive, it ought never to be practised in these cases, except for the direct objects, of giving free exit to matter already collected, and of being able to remove extraneous bodies palpably lodged. I shall once more repeat, that it is an erroneous idea, to suppose the narrowness of punctured wounds so principal a cause of the bad symptoms, with which they are often attended, that the treatment ought invariably to aim at its removal.

Recent punctured wounds have absurdly had the same plan of treatment applied to them, as old and callous fistulæ. Setons and stimulating injections, which, in the latter cases, sometimes act beneficially by exciting such inflammation as is productive of the effusion of coagulating lymph, and of the granulating process, never prove serviceable when the indication is to moderate an inflammation, which is too apt to rise to an improper height. The counter-opening, that must be formed in adopting the use of a seton, is also an objection. However, what good can possibly arise from a seton in these cases? Will it promote the discharge of foreign bodies, if any are present? By occupying the external openings of the wound, will it not be more likely to prevent it? In fact, will it not itself act with all the inconveniences and irritation of an extraneous substance in the wound? Is it a likely means of diminishing the immoderate pain, swelling, and extensive suppuration, so often attending punctured wounds? It will undoubtedly prevent the external openings from healing too soon; but cannot this object be effected in a better way? If the surgeon observes to insinuate a piece of lint into the sinus, and pass a probe through its track once a day, the danger of its closing too soon will be removed.

The practice of enlarging punctured wounds by incisions, and of introducing setons, is often forbidden by the particular situation of these injuries.

In the first stage of a punctured wound, the indication is to guard against the attack of violent inflammation. When no considerable quantity of blood has been lost, general and topical bleeding should be practised. In short, the antiphlogistic plan is to be followed. As no man can pronounce, whether such wounds will unite, or not, and as no harm can result from the attempt, the orifice ought to be closed, and covered with simple dressings. Cold applications in such cases are also highly commendable. Whether gentle compression might be made to promote the adhesive inflammation, or not, may be doubtful: I confess, that I should not have any reliance upon its usefulness. Perfect quietude is to be observed. When the pain is very severe, opium is to be administered.

Sometimes, under this treatment, the surgeon is agreeably surprised to find the consequent inflammation mild, and the wound speedily united, by the first intention. "Numerous are the examples of wounds, which penetrate the large cavities, being healed by the first intention, that is, without any suppuration. Even wounds of the chest itself, with injury of the lungs, (continues an experienced military surgeon and professor) ought to be united by the first intention." (*Assalini, in Manuale di Chirurgia, parte Secunda, p.* 13.) More frequently, however, in cases of deep stabs, the pain is intolerable; and the inflammatory symptoms run so high as to leave no hope of avoiding suppuration. In this condition, an emollient poultice is the best local application; and, when the matter is formed, the treatment is like that of abscesses in general. (See *Suppuration.*)

### POISONED WOUNDS, BITE OF THE VIPER, &C.

If we exclude from present consideration the bites of mad dogs, and other rabid animals, which subject is fully treated of in the article *Hydrophobia*, wounds of this description are not very common in these islands. Pricks of the hand sometimes occur in dissecting bodies; they are a species of poisoned wound, frequently causing considerable pain and irritation in the course of the absorbents of the limb; swelling and suppuration of the lymphatic glands of the arm, or axilla; and severe fever and constitutional irritation. An instance of the fatal consequences of such an injury must still be fresh in the recollection of the profession. (See *Case in the London Medical Repository, Vol.* 7, *p.* 288.)

In many instances, however, surgeons wound their fingers in dissecting bodies, and no particular ill consequences ensue. The healthy and robust are said to suffer less frequently after such accidents, than persons, whose constitutions have been weakened by hard study, excesses, pleasure, or some previous disease. It is remarked, also, that pricks of the fingers, met with in opening the bodies of persons, who have died of contagious diseases, and where a virus, or infectious matter might be expected to exist in such bodies, do not communicate the infection. Doubtless, (observes Richerand) the activity of those animal poisons, from which the venereal and several other diseases arise, is extinguished with life. (*Nosographie Chir. T.* 1, *p.* 102, 103, *Edit.* 4.)

With regard to the treatment of the pricks of dissecting scalpels, the surgeons of the continent recommend the immediate cauterization of the little wound with a grain of caustic potassa, or the liquid muriate of ammonia. Tonic remedies, particularly wine, is to be prescribed, and great attention paid to emptying the bowels.

The stings of bees, wasps, and hornets, are also poisoned wounds, though it is true they are seldom important enough to require the assistance of a surgeon. The hornet is not to be found in Scotland; but, it is an inhabitant of several of the woods in England. Its sting, which is more painful, than that of a bee, or wasp, is not however often the occasion of any serious consequences. The stings of all these insects are attended with a sharp pain in the part, very quickly succeeded by an inflammatory swelling, which after a short time generally subsides of itself. It has been lately observed, that the pain of the stings of venomous insects, like the bee, depends less upon the introduction of the sting into the part, than upon that of the venomous fluid. The experiments of Professor Duméril tend to prove, that, when the little poison-bladder, situated at the base of the sting, has been cut off, a wound with the sting then produces no pain. The poison, flows from the vesicle through the sting at the instant when this passes into the flesh. The exact nature of this venomous fluid is not known. It is said to be neither acid, nor alkaline. When applied to mucous surfaces, or even to the conjunctiva of the eye, it causes no disagreeable sensation; but, when it is introduced into the skin, by means of a needle, it immediately excites very acute pain.

Oil, honey, spirits of wine, the juice of the plantain, and a variety of other local applications, have been extolled as specifics for the relief of the stings of insects. Modern experience, however, does not sanction their claim to this character. In fact, none of these applications either neutralize the poison, or appease with superior efficacy the pain of the sting.

These cases should all be treated on common antiphlogistic principles, and the most rational plan is to extract the sting, taking care in the first instance to cut off the little poison-vesicle with scissars, lest in the attempts to withdraw the sting, more of the virus be compressed into the part. The stung part should then be immersed for a time in ice-cold water, and afterwards enveloped in linen wet with a lotion of acetite of lead. Were the inflammation to exceed the usual degree, leeches and aperient medicines would be proper. In short, as there is no specific for the cure of these cases, they are to be treated by antiphlogistic means.

With regard to the bites of serpents, those inflicted by the rattle-snake of America, and the cobra de capello of the East-Indies, are the most speedily mortal. Indeed, this is so much the case, that there is scarcely time to apply any remedy, although it be at hand the very moment, when the bite is received. Mr. Catesby, in the Preface to his Natural History of Carolina, informs us, that the Indians, who, by their constant wanderings in the woods, are liable to be bit by those venomous animals, know, as soon as they receive the injury, whether it will prove mortal or not. If it be on any part at a distance from large blood-vessels, or where the circulation is not vigorous, they apply their remedies; but, if any vein, of considerable magnitude, happens to be hurt, they quietly resign themselves to their fate, knowing that nothing can then be of service. It is not well known what the remedies are, on which they chiefly depend. Seneka root and volatile alkali, are among the number; and, more particularly, strong doses of arsenic, as we shall have occasion to notice again.

If we put out of consideration animals affected with rabies, the viper inflicts the worst poisoned wound, ever met with in these islands. In fact, it is an animal, which inserts into the part, which it bites, a poison, that is capable of exciting very serious consequences. The jaws of the viper are furnished with teeth, two of which in the upper jaw are very different from the rest. These, which are about three lines long, are covered for about two thirds of their length with a membranous coat, or sheath; they have a bent, or curved shape; and are articulated with the jaw-bone. They admit of being moved from before backwards, and are so disposed, that they lie down with their points turned backwards, when the animal is tranquil, and his mouth shut; but, they are instantaneously projected forwards, when he is irritated, and about to bite. These curved fangs contain canals, which terminate by a very narrow fissure, on their convex sides, a little way from their points. The rest of each of these fangs is very hard and solid; and the canal is usually filled with a transparent, yellowish fluid, which is the poison of the viper.

This venomous fluid is secreted by two glands, or rather by two clusters of glands, one on each side of the head, placed on the front of the forehead, directly behind the eye-ball, under the muscle, which serves to depress the upper jaw. Thus, the muscle cannot act without pressing upon them, and promoting the secretion of the fluid, which they are destined to prepare. A little bag, or vesicle, which is connected to the base of the first bone of the upper jaw, as well as to the end of the second, and covers also the roots of the curved fangs, forms a receptacle for the venomous liquor.

The viper is chiefly found in hilly, stony, and woody districts, and it is seldom observed in flat, or marshy places. It is not its nature to attack man, or large animals, except when provoked. Its venom is only employed for the destruction of smaller animals, such as mice, frogs, &c. which are usually swallowed whole, and to the digestion of which the venomous secretion may possibly contribute. When, however, a viper is pursued, trod upon, taken hold of, or hurt, it immediately bites, and were it only on account of the shape of the fangs, the wound might be attended with very unpleasant effects; but, it is certain of being so, by reason of the species of inoculation, which complicates it, and of which the mechanism is as follows:

When a viper is about to bite, it opens his mouth very wide. The two curved fangs, which had previously lain flat down, in the cavity of the membrane attached to their base, now project, and become perpendicular to the lower jaw. When the bite takes place, the poison is propelled through the fangs, by the contraction of the muscles, and the closure of the mouth, and it is injected into the wound with a force proportioned to its accidental quantity at the time, and the vigour of the animal.

The bite of a viper is quickly followed by severe effects, some of which are local, and the others general; but, it is with the former, that the disorder invariably commences. At the instant of the bite, the patient suffers in the bitten part an acute pain, which rapidly shoots over the whole limb, and even affects the viscera, and internal organs. Soon afterwards, the wounded part swells and reddens. Sometimes, the tumefaction is confined to the circumference of the injury; but, most frequently, it spreads extensively, quickly affecting every part of the limb, and even the trunk itself. A sanious fluid is often discharged from the wound, around which phlyctenæ arise, similar to those of a burn. After a short time, however, the pain abates considerably; the inflammatory tension changes into a doughy, or œdematous softness; the part grows cold; and the skin exhibits large livid spots, like those of gangrene. The general symptoms also come on with celerity: the patient is troubled with anxiety, prostration of strength, difficulty of breathing, and cold profuse sweats. Vomiting frequently occurs, and sometimes copious bilious evacuations from the bowels. These symptoms are almost constantly attended with an universal yellowness, and excruciating pain about the navel.

These effects occur in the same way in nearly all subjects, with some differences depending upon the particular irritability and constitution of the patient; the high, or low temperature of the atmosphere; the greater, or lesser anger of the viper; the number of its bites; the size of the reptile itself; the depth, to which the fangs have penetrated; and whether the bitten part happens to be one of great sensibility, or was naked, or not, at the time of the accident. In general, weak, pusillanimous persons, of bad constitutions, and loaded stomachs, suffer more sudden and alarming ill consequences, than strong, healthy subjects, who view the danger without fear. Several bites are of course more dangerous, than a single one; and, lastly, it has been remarked, that the venom of the viper is more active in summer, than the spring.

Severe, however, as the effects of the bite of a viper may be, they are far from being so perilous, as they are commonly supposed to be. The injury scarcely ever proves fatal.

The Abbé Fontana has particularly considered this subject, of the bites of serpents, and he agrees with Dr. Mead, that the poison of the viper is neither acid nor alkaline; but, he denies that he could perceive in it any thing like salts, by means of a microscope, which Dr. Mead says he saw. He even denies, that it has any determinate taste when put upon the tongue; though Dr. Mead assures us, that both he and others, who had tasted it, felt it exceedingly sharp and burning to the taste; and he particularly takes notice, that one gentleman, who could not be satisfied without tasting a large drop undiluted with water, had an inflammation of his tongue, and the inside of his lips, of some continuance.

From a vast number of experiments Fontana concludes, that the bite of an ordinary viper will not prove fatal to a full-grown person, nor even to a large dog, though it certainly will do so to smaller animals. Five bites from three strong and healthy vipers were not able to kill a dog weighing sixty pounds; and, as this dog was little more than a third part of the weight of an ordinary man, he concludes, that a single bite can never be fatal to an adult. In confirmation of this, he says, that he has seen a dozen cases himself, and that he has heard of fifty more, only two of whom died. Concerning one of these cases he could get no information; the other perished of a gangrene, twenty days after the bite, and which began in three days after it, the bitten place having been deeply scarified almost immediately after the injury was received. Fontana believes, that much of the faintness, &c. which ensue upon the bite of a viper, are the mere effects of terror. "Upon a person's being bit, (says he) the fear of its proving fatal terrifies himself and the whole family. From the persuasion of the disease being mortal, and that not a moment is to be lost, they apply violent, or hurtful remedies. The fear increases the complaint. I have known a person, that was imperceptibly bit, in the hands or feet, and who, after seeing the blood, and observing a viper near him, suddenly fainted away; one, in particular, continued in a swoon for upwards of an hour, until he was accidentally observed, and recovered out of it, by being suddenly drenched in cold water. We know, that death itself may be brought on by very violent affections of the mind, without any internal disease. Why may not people, that are bit, die from a disease, produced entirely from fear, and who would not otherwise have died from any complaint produced by the venom?" Although it must be owned, that Fontana bestowed a great deal of attention upon this subject, the above reasoning is hypothetical and inconclusive. Some very timid, delicate, or nervous people might die from fear alone; but, it is by no means fair to conclude, that the generality of people would do so. It is easy to see, that the bite of a viper must be more or less dangerous, according to circumstances.

I have already observed, that the danger of the bite of a viper has been much exaggerated, and that the injury seldom proves fatal. Whenever the patient dies, the catastrophe is always ascribable to the quantity of venom inserted into the wound; the number of bites; their situation near important organs, and the neglect of proper means of relief. In ordinary cases of a single bite upon the extremities, the patients would get well even without any assistance; but, the symptoms would probably be more severe, and the cure slower.

Numerous remedies for the bites of vipers have obtained celebrity. According to certain writers, each of these remedies has effected wonderful cures; and, yet, as Boyer well remarks, every one of them has been in its turn relinquished for another, the sole recommendation of which has frequently consisted in its novelty. Any of these boasted medicines, though of opposite qualities, cured, or at least seemed to cure the patients, and the partisans of each considered, that he had a right to extol his own remedy as a specific, when the patient, to whom he administered it, was seen to recover perfectly, after suffering a train of severe symptoms. But, the reason of this pretended efficacy becomes obvious, when one knows, that the bite of a viper is of itself very rarely mortal to the human subject, and that the severity of the symptoms always depend upon the quantity of the venom in the wound. (*Boyer, Traité des Maladies Chir. T.* 1, *p.* 428.)

The treatment of the bite of a viper is divided into local, and general means.

The local treatment has for its principal object the destruction of the venom; the prevention of its entrance into the absorbent vessels, or the removal of it from the wound.

Of scarifying the wound, I shall only say, that, it promises no utility, if it be practised with a view of letting such dressings get into the part as are extolled, as specifics; for, we now know, that there is no local application, which is entitled to this character. Fontana was an advocate for applying a ligature round the limb, in order to check the ingress of the venom into the circulation; he thought he had seen much good result from this practice. No moderns, however, have any reliance upon the method, which is even attended with a risk of causing gangrenous mischief. Suction of the wound has been proposed. It seems founded on reason; but, experience, I believe, has determined little in its favour. It is doubtful, also, whether the venom would not occasion troublesome effects in the person who sucks. At least, Fontana and Mead are at variance upon this point. A cupping glass might indeed be employed without this objection; but, it is probable, that no mode of suction could effectually extract the poison, and the proposal is at present never adopted.

The most certain method of removing the virus consists in the excision of the bitten part. This operation, however, would hardly be proper, unless done immediately after the injury, before much inflammation had come on. It is likewise a thing, to which many patients would not assent, and even some surgeons may deem the proceeding too severe. The particular situation of the bite might also be a strong objection to the practice.

Another plan, which is more commonly preferred, is that of destroying the envenomed part with caustic, or the actual cautery. When this is done in time, the poison is prevented from extending its irritation over the nervous system, through the medium of which all the worst symptoms are usually excited. The caustic, and cautery, may also have the effect of chemically destroying the venom itself, while they must tend to hinder its absorption, inasmuch as they destroy the neighbouring absorbent vessels. Fontana preferred pure potassa, as a caustic. He was convinced by a great many experiments, that it ought to be regarded as a true specific. But, as Professor Boyer sensibly remarks, every caustic must infallibly have the same effect, as its mode of operating is that of destroying the point of irritation, viz. the seat of the venom. In France, liquid caustics are at present preferred; such as the fluid muriate of antimony; or the sulphuric, or nitric acid; because their action is quicker, and they more certainly penetrate to the bottom of the wound. (*Traité des Mal. Chir. T.* 1, *p.* 429.) Either of these liquids may be applied by means of a slender pointed bit of wood, which is to be dipped in it, and then introduced into the punctures made by the fangs of the reptile. The piece of wood should be withdrawn, wet once more, and applied again. If a drop of the caustic can be inserted, so much the better. When the bite is very narrow and deep, the caustic cannot well be introduced, before the mouth of the wound is somewhat enlarged with a lancet. A little bit of lint may then be wet in one of the above fluids, and be pressed deeply into the wound.

After the caustic has produced an eschar of the wound, the best application is an emollient poultice.

It is not, however, every bite of a viper, that requires local treatment, even of this degree of severity. As Boyer observes, when the wound is superficial; the viper benumbed with cold; its poison considerably exhausted by its having previously bitten other animals; the swelling inconsiderable; and the patient neither affected with prostration of strength, nor pain about the præcordia; a few drops of ammonia may be introduced into the wound, and a small compress wet with the same fluid applied. Olive oil obtained in England great repute, as a dressing for the bites of snakes, and Pouteau in France afterwards extolled its virtues; but, says Boyer, it possesses no specific efficacy in these cases, as the experiments of Hunaud and Géoffroi have decidedly proved. (*Traité des Maladies Chir. T.* 1, *p.* 431.)

With respect to the general treatment, if we exclude emetics, of which Dr. Mead had a high opinion, when the patient was much jaundiced, experience decides chiefly in favour of exhibiting stimulating cordials, ammonia, and, particularly, arsenic. The ancients employed theriaca, Mithridates, viper's salt, and the carbonate of ammonia, which means generally answered. Of all stimulants, the aqua ammoniæ puræ is now that, which obtains the greatest confidence; or, else, the *eau de luce*, which only differs from the fluid ammonia, in containing a small quantity of the oleum succinatum. In France, this remedy is at the present time regarded, as having the best claim to the title of a specific for the bite of the viper. (*Boyer, Op. cit.*)

In France, Bernard de Jussieu first tried ammonia in the year 1747 (See *Hist. de l' Acad. des Sciences*, 1747); since which time it has been extensively employed for the cure of the bites of vipers, both as an internal and external remedy. It had, however, been highly praised by Dr. Mead, at a much earlier period. Diluted with oil, says Boyer, it forms a good resolvent liniment. A few drops of it undiluted, when instilled into the wound, make an eligible mild caustic; a compress of lint, wet with it, is a good application to the wound; and, when the medicine is internally taken, it supports the strength, promotes the secretions, and induces copious perspiration.

A few drops of the remedy are to be exhibited every two hours; but, as it is very owerful, it must always be taken in a suficient quantity of tea, or other drink. The dose, however, must depend upon the age and constitution of the patient, and the intensity of the symptoms. Four or five drops suffice for a person of weak, delicate, irritable habit; but twelve or fifteen may be given to stronger subjects, and when the symptoms are violent. With ammonia, some practitioners order wine; but, in the early stage of the case, the rest of the treatment is conducted on antiphlogistic principles.

The medicines recommended for the bites of vipers are, according to M. Fontana, not only of very different, but even opposite, qualities. "In no country, (says he) through which I passed, could I ever find any two people or persons, bit by the viper, either in the mountains or valleys, that used the same remedies. Some used theriaca alone, either externally or internally applied; others common oil; a third set used stimulants, such as the strongest spirituous liquors; whilst others, on the contrary, tried every different kind of sedative. In short, there is hardly any active kind of medicine that has not been tried as a cure in this disease: while, at the same time, it is certain, that, under all the varieties of application, none of them died." Hence, Fontana concluded, that none of the remedies made use of had any effect in curing the disease.

Mr. Chevalier was induced to recommend the trial of arsenic in these cases from the facts recorded in Dr. Russell's History of Indian Serpents, on the authorities of Mr. Duffin and Mr. Ramsay, and from which it appears, that the Tanjore pill, of which arsenic is in all probability the chief ingredient, is exhibited with considerable success in India after the bites of venomous serpents.

Mr. Ireland, surgeon to the fourth battalion of the sixtieth regiment of foot, had formerly heard Mr. Chevalier recommend the trial of arsenic for the bites of serpents, and he was resolved to make the experiment whenever an opportunity offered. On his arrival in the island of St. Lucia, he was informed, that an officer and several men, belonging to the sixty-eighth regiment, had died from the bites of serpents, supposed to be the coluber carinatus of Linnæus. Mr. Ireland also learnt, that every thing had been tried by the attending medical men to no purpose, as all the patients had died, some in six, and others in about twelve hours, from the time of their receiving the wound.

A case, however, soon came under Mr. Ireland's own observation, and, as nothing, that had been done before, seemed to have been of any service, he was determined on giving arsenic a full trial.

"Jacob Course, a soldier in the York ght infantry volunteers, was bitten in the left hand, and the middle finger was so much lacerated, that I found it necessary to amputate it immediately at the joint with the metacarpal bone.

"I first saw him about ten minutes after he had received the wound, and found him in a torpid senseless state: the hand, arm, and breast of the same side were much swelled, mottled, and of a dark purple, and livid colour. He was vomiting, and appeared as if much intoxicated. Pulse quick and hard: he felt little or no pain during the operation.

"The wound being dressed, and the patient put to bed, I ordered a cathartic clyster, and the following medicine to be taken immediately. ℞. Liquor. Arsenic. ʒij. Tinct. Opii gt. x. Aq. Menth. Pip. ℥iss; which was added to half an ounce of lime juice, and as it produced a slight effervescence, it was given in that state: this remained on his stomach, and was repeated every half hour for four successive hours. In the mean time, the parts were frequently fomented with common fomentation, and rubbed with a liniment composed of Ol. Terebinth. ℥ss. Liquor. Ammon. ℥ss. and Ol. Oliv. ℥iss. The cathartic clyster was repeated twice, when the patient began to be purged; and the arsenical medicine was now discontinued. He had become more sensible when touched, and, from that time, he gradually recovered his faculties; he took some nourishment, and had several hours sleep.

"The next day, he appeared very weak, and fatigued; the fomentation and liniment were repeated. The swelling diminished gradually; the natural colour and feeling returned, and, by proper dressings to the wound and the attention to the state of his bowels, he soon recovered and returned to his duty."

Mr. Ireland recites about four other examples, in which arsenic was exhibited with similar success.

It deserves particular notice, that the liquor arsenici employed by Mr. Ireland was prepared according to Dr. Fowler's prescription, which directs sixty-four grains of arsenic, and as many of the fixed vegetable alkali, to be dissolved in a sand heat, and the solution to be made an exact pint, so that two drachms contain one grain of arsenic in solution. (See *Medico-Chirurgical Transactions, Vol. 2, p. 393, &c.*)

### WOUNDS OF THE THORAX.

The term, *thorax*, is said to be derived from the Greek verb, *ϑωρεω*, to leap, because the heart leaps, or pulsates in it.

In the language of anatomy, the thorax or chest implies the upper part of the trunk, or that portion of the body, which is surrounded by the sternum, the ribs, and the dorsal vertebræ.

The chest is subject to different kinds of injuries, produced by external causes, and the important nature of the organs, which it contains, renders the consideration of such cases of the highest conseqence to the practitioner. In speaking of *Fractures of the Ribs, Emphysema, Paracentesis of the Thorax, &c.* an account has already been offered, of some affections of the thorax, which are very essential to be known by every surgeon. In the present article, we intend to treat of the subject of wounds, interesting this part of the body; but, before beginning what we have to say, concerning these cases, it seems proper to remind the reader of some anatomical circumstances, relative to the thoracic viscera.

The thorax is a very large cavity, of an irregularly oval figure, bounded in front by the sternum, laterally by the ribs, posteriorly by the vertebræ of the back, above by the clavicles, and below by the diaphragm, a very powerful muscle, which forms a kind of partition between the cavity of the thorax, and that of the abdomen.

The diaphragm is not stretched across, in a straight direction, from one side of the chest to the other; but, on the contrary, descends much further in some places, than in others. If the cavity of the thorax be opened, by a transverse section, about the middle of the sternum, the diaphragm appears, on examination, to be very prominent and convex towards its centre, while it sinks downward at its edges, towards all the points, to which the muscle is attached. At its anterior, and most elevated part, it is fixed to the ensiform cartilage, whence, descending obliquely to the right and left, it is inserted, on both sides, into the seventh rib, all the lower ribs, and, lastly, to the lower dorsal vertebræ. According to this description, it is obvious, that the cavity of the thorax has much greater depth and capacity behind, than before; a circumstance, which surgeons ought to be well aware of, or else they will be liable to give most erroneous opinions, concerning wounds of the chest. For instance, a practitioner, deficient in anatomical knowledge, might imagine, that a weapon pushed from above downward, into the front of the chest, could never reach the lungs, after having penetrated the cavity of the abdomen. It is a fact, however, that no instrument could pass in this direction, even some inches below the highest part of the abdomen, without entering into the cavity of the chest.

The whole cavity of the thorax is lined with a membrane, named the pleura, which is every where adherent to the bones, which form the parietes of this cavity, and to the diaphragm. Each side of the thorax has a distinct pleura. The two membranes meet in the middle of the chest, and extend from the sternum to the vertebræ. In this manner, two cavities are formed, which have no sort of communication with each other. The way, in which the two pleuræ touch, and lie against each other, forms a middle partition, which is called the mediastinum. These two membranes are intimately adherent to each other, in front, the whole length of the sternum; but, behind, where they approach the vertebræ, they separate from each other, so as to leave room for the passage of the aorta, œsophagus, &c. The heart, enclosed in its pericardium, occupies a considerable space on the left of the mediastinum, all the rest of the cavity of the chest being filled with the lungs, except behind, where the large blood-vessels, nerves, thoracic duct, and œsophagus, are situated. In the perfectly healthy state, the lungs do not adhere to the pleura; but, in this climate, at least, the majority of subjects, who are examined after death, are found to have such adhesions in different places. The disease may probably be occasioned by a very slight inflammation in the chest; and, as the surface of the lungs is naturally destined to be always in close contact with the pleura, and patients are frequently not suspected to have any thing wrong in the thorax, this morbid change being often accidentally discovered after death, in looking for something else; we may conclude, that it does not occasion any inconveniences.

The thorax is subject to all kinds of wounds; but, the importance of these injuries most particularly depends on the depth, to which they extend. Such as do not reach beyond the integuments, do not differ from common wounds, and, when properly treated, are seldom followed by any bad consequences. On the contrary, those which penetrate the cavity of the pleura, even by the slightest opening, are apt to occasion, under certain circumstances, the most alarming symptoms. Lastly, such wounds, as injure any of the thoracic viscera, are always to be considered, as placing the patient in a state of considerable danger.

From what has been said, it appears, that wounds of the thorax are very properly divisible into three kinds: viz. 1. such as only affect the skin, and muscles; 2. such as enter the cavity of the chest, but injure none of the viscera; 3. others, which injure the lungs, or some other viscus.

### SUPERFICIAL WOUNDS OF THE THORAX.

Immediately a surgeon is called to a recent wound of the chest, his first care should be to endeavour to ascertain, whether the weapon has penetrated the chest, or not. An opinion may be formed on this subject, by attending to several circumstances. 1. Surgical writers recommend, for this purpose, placing the wounded person in the same posture, in which he was, when he received the wound, and then carefully examining with a finger, or probe, the direction, and depth of the wound. 2. We are also advised, if possible, to get the weapon, with which the injury was inflicted, and, by the bloody part, judge how far it has penetrated. 3. We are advised to inject some liquid into the orifice of the wound, and to observe, whether it regurgitates immediately, or lodges in the part. 4. The colour and quantity of the blood, emitted from the wound, are to be noticed, and whether any is coughed up. 5. We are to examine, whether the circumference of the wound becomes emphysematous, or any air escapes from its orifice in respiration. 6. Lastly, the state of the pulse and breathing is to be attended to.

In treating of wounds of the abdomen, I have cautioned surgeons against being too officious in probing such injuries, merely, for the sake of gratifying their own curiosity. The same advice is equally applicable to the present cases. Surgical authors have, perhaps, dwelt too much on the subject of probing wounds of the abdomen, and thorax, and their readers imbibe an opinion, that, until they have traced the wound, with their finger, or probe, to its very bottom, and termination, they are not qualified to put in practice any surgical measures. The only advantage of knowing, that a wound penetrates the chest, is that the practitioner immediately feels himself justified in having recourse to bleeding and other antiphlogistic means, and thus averts inflammation of the pleura, and lungs, which affection, when it has made progress, often proves fatal. However, there can be little doubt, that if the nature and depth of the wound cannot be readily detected, with the eye, the finger, or a probe, it is much safer to bleed the patient, than to put him to useless pain, irritate the injury with the introduction of instruments, and waste opportunities of doing good, which too frequently can never be recalled. In short, it is better, and more advantageous, for all patients, that some of them should lose blood, perhaps, unnecessarily, than that any of them should die, in consequence of the evacuation being omitted, or delayed.

Almost all the writers, who have taken pains in directing, how wounds of the thorax should be probed, conclude with remarking, that, however advantageous a knowledge of the direction and depth of the wound may be, much harm has frequently been done by pushing the attempts to gain such information too far. It is, perhaps, of greater importance to ascertain, by some kind of examination, the extent of a wound, which does not reach beyond the integuments, or intercostals, than to know, whether the wound extends into the cavity of the chest. For, even when the pleura is found to be divided, if the wound is attended with no urgent symptoms, the information is of no practical use, if we make it a rule to adopt, without the least delay, a strict antiphlogistic plan of treatment, in all cases, in which there is any doubt, or chance of the parts, within the chest, being wounded, and likely to inflame. Besides, very frequently, the symptoms are more urgent and alarming, than they could be, were only parts on the outside of the thorax injured ; and, in these instances, it is obvious, that the employment of a probe cannot be necessary for discovering, that the wound extends into the chest.

We have above adverted to inspecting the weapon, with which the wound was inflicted, as a mode of gaining some information, concerning the probable depth of the wound. Enquiry may also be made, in what direction it was pushed; and, sometimes, the blood on the instrument will denote how deeply it penetrated. It is clear, however, that though information of this kind may be obtained, in a few instances, in general, it is otherwise.

When, by any of the above means, it cannot be learnt, whether the wound penetrates the chest, or not, various authors recommend the injection of luke-warm water. If the water regurgitates at once, they conclude, that the injury is only superficial; but, when the fluid, either wholly, or in part, continues in the wound, without producing any external swelling, they infer with certainty, that an opening has been made in the pleura. This plan of examining the state of parts, however, is much more objectionable, than the employment of a probe ; for, if the liquid be propelled, with a certain degree of force, for the purpose of driving it to the bottom of the wound, parts, which were not before hurt, will in this manner become injured. The fluid may also be injected into the cavities of the cellular substance, and may seem to be passing through the track of the wound into the chest, while, in reality, not a drop does so. Besides, is it a warrantable proceeding to try to insinuate any quantity, or kind, of liquid, whatever, between the pleura and lungs, into a situation, in which it must necessarily obstruct the important function of respiration, and cause serious inconvenience?

When air issues from the wound in expiration, there is ground for suspecting, that the lungs are wounded. But, authors have erred in setting down this circumstance, as an infallible criterion of the nature of the accident; for the same symptom may happen, when there is only an opening made into the chest, without any injury of the lungs whatever. The air, which is expelled in expiration, has previously got into the bag of the pleura through the wound, in inspiration. In such cases, the external air insinuates itself, through the opening into the chest, between the pleura and lungs, and, it will be seen to escape, during expiration, although the lungs may not be at all wounded. In order to remove all doubt upon this subject, the patient should be requested to expire, as strongly as he can, so as to force out whatever air may have accumulated in the chest. At the end of each expiration of this kind, care must be taken to bring the skin closely over the orifice of the wound, and to keep it thus applied, during each following inspiration, for the purpose of preventing the external air from entering. In this way, if there be no wound of the lung, all the air will soon be expelled; but when some still continues to come out in expiration, we may conclude, with certainty, that the lungs are wounded.

Sometimes, an emphysematous swelling takes place round wounds of the thorax, in consequence of a quantity of air diffusing itself in the cellular substance. This symptom is very uncommon in wounds, which are straight, and ample; but, it is by no means, unfrequent, in wounds caused by narrow stabs, more especially oblique ones, and by the points of broken ribs. (See *Emphysema.*) When a considerable quantity of blood flows from a wound of the chest, there is great cause for conjecturing, not only, that it has penetrated the cavity of the thorax, but, also, that some of the thoracic viscera are injured. Excepting the intercostal arteries, which run along the lower edges of the ribs, and the trunks of the thoracic arteries, all the other vessels, on the outside of the chest, are very inconsiderable. A proper compression will soon shew, whether the blood escapes from an artery on the outside of the cavity of the pleura. The situation, and direction of wounds very frequently denote at once, that the hemorrhage cannot proceed from any of the trunks of the thoracic arteries.

Even the appearance of the blood, which comes from the wound, may lead to some conjectures, concerning the depth of the injury. The blood, which flows from wounds of the lungs, is of a brighter scarlet colour, and more frothy, than that which is emitted from the vessels of any other part.

There can be no doubt of the lungs being wounded, when the patient is observed to spit up blood; but the absence of this symptom is, by no means, to be regarded as a proof of the contrary.

The state of the pulse, and that of respiration, ought to be particularly attended to by the practitioner. Neither one, nor the other, seems altered, at least at first, when wounds do not reach more deeply, than the integuments; but, those, which penetrate the cavity of the thorax, and, especially, such as injure any of the viscera, may frequently be distinguished, from the very first moment of their occurrence, by their effects on the sanguiferous system, and the function of respiration. When the lungs happen to be wounded, at a place where they have contracted an adhesion to the pleura, the wound may extend to a great depth, and yet no air may be diffused in the cavity of the thorax, nor the functions of these organs be at all disturbed. But, when either air or blood, has insinuated itself between the lungs and the pleura, the lungs become immediately oppressed, the breathing is attended with difficulty, the pulse is weak, contracted, and intermittent; and no doubt can be entertained, concerning the nature of the injury.

Having said enough, relative to the diagnosis of wounds of the thorax, we shall next consider their treatment.

Wounds of the thorax, which only injure the integuments, are not generally attended with any danger; they heal with the same readiness, and by the same means, as common, superficial wounds in any other part of the body.

But, when the surgeon has to treat a punctured, or a gun-shot wound, it is too frequently directed, by writers on surgery, to lay open the track of the injury, from one end to the other with a knife, if its course should not be too extensive, and then to dress the cavity down to the bottom. Such authors also add, that when the track of the wound is so extensive, as not to admit of this plan, it is better to introduce a seton through it. Their object, in employing these methods, is to prevent the outer part of the wound from healing too soon, and thus give time for the whole of it to heal in an equal degree. Afterwards, they advise the silk of the seton to be gradually diminished, and, when, at length, the whole of it is removed, a slight degree of compression, kept up for a few days, is deemed sufficient for the completion of the cure.

The French surgeons have the discredit of bringing setons into fashion in this branch of surgery, and I am particularly glad, that an able modern writer has exposed the absurdity of the practice. "We find (says Mr. John Bell) the history of it, to be plainly this: that as Guy de Chauliac, Paré, and all the older surgeons, did not know how to dilate gunshot wounds, they found these same setons useful in bringing the eschar sooner away, and in preserving an open wound; and, as they believed the wounds to be poisoned, they took the opportunity of conducting, by these setons, whatever acrid medicines might, according to the prevailing doctrines of that time, have any chance of correcting the poison." Mr. J. Bell notices, how surprising it is to see the cruelty, and perseverance, with which some modern practitioners, particularly, French, draw these cords through wounded limbs; and when the roughness of such a cord, or the acrimony of the drugs conveyed by it, produces a copious suppuration, these men are delighted with such proofs of their success. The setons have been introduced by the French surgeons, across the thickest parts of the limbs, along the whole length of the fore-arm, and, at the same time, frequently through the wrist-joint. The setons have also been covered with stimulating applications. Profuse suppurations, and dreadful swellings of course ensued; still, as Mr. J. Bell has remarked, these cruelties were continued, till the wound healed almost in spite of the pain; or till the coming on of very dreadful pain, great suppurations, convulsions, &c. made the surgeon discontinue the method, or even amputate the limb. The French have become so familiarized to setons, that they do not restrict their use to flesh wounds, they pass them quite across the thorax, across the abdomen, and even through wounds of the knee-joint.

When we wish to excite inflammation, in the cavity of the tunica vaginalis, for the purpose of radically curing a hydrocele, we either pass a seton through the part; lay it open with an extensive incision; cram a tent into it; or inject some irritating fluid into it. While the animal machine continues the same, says Mr. John Bell, the same stimuli will produce the same effects, and a seton, injection, or long tent, if they produce pain and inflammation in the scrotum, will not be easy in the chest; and, unless we can use them in the chest, with the same intentions, with which we use them in the hydrocele, (in other words) unless we are justified in inflaming the chest, and causing an adhesion of all the parts, we cannot use them, with any consistency, or good sense.

With regard to the cases, which the French adduce in confirmation of the good effects of their plans, I am entirely of opinion with Mr. J. Bell, that the facts only prove, that *the patients recovered in spite of the setons.* "It is like (adds this author) what happened to a surgeon, who was dabbling in the thorax with a piece of caustic, which fell directly into the cavity of the chest, where it caused very large suppurations, and yet the patient was saved. The patient recovered, in spite of the caustic, just as M. Guerin's patient, and many other poor unhappy souls, who lived in spite of the setons. One would think, that people took a pleasure in passing setons across the eye-ball, the chest, the knee-joint, &c. merely to make fools stare, when the business might be as effectually done with an abscess lancet."

Mr. John Bell, in his usual lively style, makes the employment of tents, in wounds of the chest, seem equally ridiculous and improper. Indeed, he says, *he knows of no occasion in all surgery, in which tents can be useful, except in the single one of a narrow opening, which we desire to dilate, in order to get at the bottom of the wound; and where either, on account of some great artery, or the fearful temper of our patient, we dare not use the knife.* (See *J. Bell on Wounds. Discourse* 2, *Vol.* 2.)

Having hitherto been engaged, rather in pointing out, what ought not to be done, that what ought, I shall next make some remarks on the line of conduct, which should be adopted, in cases of wounds of the parietes of the chest.

When the wound is a common cut, the sides of the division are to be brought into contact, and maintained in this position, by the aid of strips of adhesive plaster, compresses, and a bandage, until they have grown together. There will very seldom be any occasion to employ sutures in these instances, if the surgeon only observe to relax such muscles as happen to be cut, or to be situated immediately under the wound of the integuments.

As cut wounds seldom, or never penetrate the chest, and there is generally no reason, why they should not unite by the first intention, without being followed by extensive inflammation and abscesses, only a moderate use of antiphlogistic means will usually be necessary. Bleeding will not often be requisite. The grand objects are, to keep the patient in a quiet state, on rather a low diet, and to hinder him from taking wine, porter, spirits, or any stimulating beverages.

If the wound, instead of healing favourably, should inflame, the treatment should be regulated by the principles laid down in the article *Inflammation.* If it should suppurate over its whole surface, still the sides generally ought to be kept approximated by one, or two strips of sticking plaster; for, in this way, the cavity, which must now be filled up by granulations, will be rendered much smaller, than it otherwise would be. The softest particles of lint may be laid in the cavity of the wound, which the sticking plaster does not entirely remove, and over the whole a pledget of some mild, unirritating ointment. No pressure is now proper, until the inflammation diminishes; and if the matter should be very copious, attended with much surrounding inflammation, the best application would then be an emollient poultice. The patient should also be bled, and leeches may be applied, as often as necessary, round the wounded part.

When the case is a stab, or punctured wound, the fibres of the divided parts are not simply cut, they are also considerably stretched, bruised, and otherwise injured. Hence, they cannot, in general, be expected to admit so readily of being united, as the sides of a clean incision, made with a sharp instrument. However, the possibility of uniting the opposite sides of punctured wounds must depend very much on the shape of the weapon, and the suddenness, roughness, and violence, with which it was driven into the part. A prick with a needle is a punctured wound; so is that so often made by surgeons with their lancets; yet, these injuries do not frequently bring on violent inflammation, and abscesses, like those wounds often do, which are inflicted with bayonets, and pikes.

Let us suppose a man to have received a thrust of a bayonet, which has run into the skin and muscles, covering one side of the thorax; what plan can the surgeon follow, with the greatest advantage to his patient?

Instead of laying open the whole track of such a wound with a knife, as is barbarously recommended in many of the principal works on surgery; instead of drawing a seton through its whole course, or of cramming into the part, a hard, irritating tent; the practitioner should take whatever chance there is of uniting the wound without suppuration. For this purpose, he should recollect, that the great degree of violence, done to the parts in punctured wounds, is the reason, why they are so apt to inflame and suppurate. Hence, the expected inflammation is (to use a vulgar expression) to be knocked on the head, if possible, in the very first instance; and immediately the wound is dressed, the patient should be freely bled, and take some saline purgative medicines. With regard to the dressings, the orifice of the wound may be closed with sticking plaster, if the circumstance is practicable; if not, it may be covered with any mild superficial applications. Over and around these, the surgeon may lay some folds of linen, which are to be kept continually wet with cold water, or a lotion containing the acetite of lead. Many patients, however, have a strong dislike to the application of cold fluids to wounds situated upon their trunk, and, although in principle such applications are right, it is often necessary to dispense with them in practice. A roller is to be employed for retaining the dressings; but, it need not be put on tight, as pressure is more likely to do harm, than good. Thus the inflammation of the wound will be moderated; the extravasation of blood prevented; the chance of union by the first intention taken; and all painful operations avoided.

If strict antiphlogistic means be employed, many stabs unite without abscesses, when surgeons entertain little hope of such success.

But supposing, that suppuration follows, and a collection of matter takes place, will the patient suffer more, or be put into greater danger, by having a proper depending opening, of just sufficient size, now made into the abscess in an eligible place, than if he had submitted to have the formidable operation of laying open the whole extent of a stab, performed in the first instance. In short, will he suffer half so much, be half so long in getting well, or have to encounter half the danger? With all this advantage, he will have taken a certain chance, which attends all these cases, of the wound becoming united by, what is called, the first intention, that is to say, without any suppuration. I need not enlarge upon this subject, but refer the reader to what has been said on *Punctured Wounds* in this article, and to the treatment of abscesses, in the article *Suppuration.* Gun-shot wounds, only injuring the parietes of the chest, are to be treated, according to the principles explained in the article *Gun-shot Wounds.*

### OF WOUNDS PENETRATING THE CAVITY OF THE THORAX.

Wounds, which penetrate the chest, are always dangerous, and, consequently, claim the utmost attention of the practitioner. We shall first treat of such wounds as enter the cavity of the thorax, but without injuring any of the viscera.

In the healthy state, the lungs so completely fill the cavity of the thorax, that, both in inspiration and expiration, they are always in close contact with the pleura; and, whenever air, blood, or any other matter, insinuates itself between the outer surface of the lungs, and the inner one of the pleura, more or less oppression, and difficulty, of breathing immediately take place. In all wounds, attended with a division of the pleura, occurring in a situation, where there happens to be no adhesion between this membrane and the lungs, some of the external air, or a small quantity of blood, or both, can hardly fail to get into the cavity of the thorax. If one of the intercostal arteries should be wounded, and the external wound be, at the same time, very narrow, the blood, furnished by this vessel, may insinuate itself inwardly into the chest, and immediately occasion oppression of the breathing, and other symptoms of pressure on the lungs. Of what is to be done in this case, we shall presently speak.

When a wound is known to have entered the pleura, and there is no symptom leading to a suspicion, that the lungs, or any large vessel, is wounded, the injury is to be dressed according to common principles, and the more superficially the better. Authors also usually direct us, just before we close the opening, to tell the patient to make a deep inspiration, for the purpose of expelling as much of the air as possible, which may have got into the cavity of the pleura. At the end of such inspiration, the edges of the wound in the skin are to be brought together, and kept so, with sticking plaster compresses, and a roller, applied round the body. The other grand indications, in the treatment, are to avert inflammation of the pleura and lungs, by a rigorous adoption of the antiphlogistic plan, copious bleeding, in particular, not being forgotten.

Let us now consider such wounds as penetrate the chest, and are complicated with some of the following circumstances: 1. With the presence of foreign bodies. 2. With injury of one of the intercostal arteries. 3. With a protrusion of a portion of the lungs. 4. With a considerable emphysema. 5. With an extravasation of blood in the thorax.

1. Almost all wounds, which penetrate the chest, occasion pain and difficulty of breathing. Many of them are also followed by an emphysematous swelling round the wound; the patient is frequently attacked by a spitting of blood; and, after having had, for some time, a small, contracted, irregular pulse, with a pallid countenance, and cold extremities, he is too often seized with febrile symptoms. These should be counteracted by bleeding, diluent beverages, a proper regimen, quietude, and external applications of the resolvent kind. If such symptoms should continue longer, than the first few days, without any diminution, writers inform us, that there is ground for suspecting, that they depend upon the presence of some foreign body. However, it may be doubted, whether Sabatier's advice, immediately to make search after the extraneous substance, is proper, under these circumstances. For my own part, I cannot think the symptoms, above related, by any means unequivocal, and even were they so, the practice would still be questionable. (See *Médecine Opératoire, tom. 2. p.* 244.)

M. Sabatier has quoted the two following cases, for the purpose of shewing what may be attempted in these cases.—"A man, twenty-seven years of age, was struck very violently with a knife, on the outer part of the fourth true rib. Simple dressings were applied for the first few days; but, a considerable coughing, and spitting of blood ensuing, M. Gerard was consulted. This gentleman found, that the symptoms depended, on the presence of a piece of the blade of the knife, which pierced the rib, and projected, to the extent of about six lines, into the cavity of the thorax. So little of the foreign body was on the outside of the rib, and it was so fixed in the bone, that it could neither be extracted with any kind of forceps, nor even moved in the least with a leaden mallet, &c. Although, in these urgent circumstances, there seemed to be no other resource, except that of sawing, or cutting out the portion of the rib, M. Gerard thought, that an attempt might first be made to extract the foreign body, by pushing it from within outward. For this purpose, having put a steel thimble on his index finger, he introduced it into the cavity of the thorax, and thus succeeded in pushing out the piece of the knife.

"The foreign body being taken out, M. Gerard next introduced his finger, without the thimble for the purpose of examining, whether the inner surface of the rib was splintered. A spicula of the bone was in fact detected, capable of pricking the parts within the chest; but, it was too firmly connected with the rest of the rib to admit of being completely taken out. Hence, M. Gerard adopted the plan of making the splintered piece of bone continue in close contact with the main portion, by immediately surrounding the whole rib, at the splintered part, with a ligature. This was passed by means of a curved needle, and firmly tied over a thick compress." To these ingenious proceedings, as the French term them, was imputed, not only the cessation of all the bad symptoms, but a speedy recovery. (See *M. de la Faye's Notes to the Traité des Opérations de Dionis.*)

M. Sabatier quotes another case, which we next insert in this Dictionary, for the information of the reader.

An officer was shot in the left side of the chest. The ball entered about where the bone and cartilage of the seventh true rib unite, and came out in the situation of the angle of the same bone, which was broken in two places. The neighbouring part of the first false rib was also broken behind. Incisions were made, which enabled the surgeon to take away several splinters of bone, and facilitated, (that absurd French practice) the introduction of a seton. Soft mild dressings were put on the wounds. In consequence of the dangerous nature of the accident, the patient was bled twenty-six times, with a view of relieving the fever, difficulty of breathing, and spitting of blood. On the fifth day, suppuration had begun to take place, and the seton could be easily drawn. In about a fortnight, the patient experienced a considerable abatement of his sufferings, and passed some of the ensuing days in a tolerably easy state. Circumstances having made it necessary to move him to another place, on the twenty-fourth day, he had an uneasy night; febrile symptoms took place, and the discharge was not of its usual consistence. Two more bleedings were practised, and the critical state of the patient led the surgeon to examine the wounds again. On passing a finger into the wound, which was situated behind, a foreign body was felt, and easily extracted. It proved to be a piece of the patient's coat. A spicula of bone was also felt more deeply lodged, which required the posterior wound to be dilated for its extraction. Some amendment followed the removal of these extraneous substances.

On the thirtieth day from the receipt of the wound, the bad symptoms having come on again, two more bleedings were practised, and, *as fear was entertained that the seton did harm*, it was suppressed. The patient now first made complaint of feeling something, which pricked him, in a deep situation, between the two openings of the wound. It was found impracticable to ascertain the cause of this sensation, without dividing all that intervened, between the two wounds, and which formed a space of seven or eight finger-breadths. This serious operation was resolved on in a consultation, and M. Guerin set about it by cutting from within outward, the parts between the two ribs, with the aid of a finger introduced into the posterior wound. Care was taken not to cut near the lower edge of the upper rib. In this way, the whole track of the ball was laid open, and in the middle of it, a very sharp splinter was found, sticking in the substance of the lungs. This was removed, and the wound dressed with simple applications. From this day all the bad symptoms ceased, and the cure was completed at the end of four months. (*Obs. de Guerin in Mem. de l' Acad. de Chirurgie, tom.* 2 ; 4*to*.)

Mr. John Bell has taken notice of the preceding case: he observes, that some of M. Guerin's steps were bold and good, as well as successful; but, that the employment of the seton was wrong. The example teaches us several important circumstances: 1. The propriety of making very free dilatations for the extraction of splintered pieces of bone. 2. The utility of repeated copious bleedings, which, in the above case, indeed, had the greatest effect both in preventing such hemorrhage in the chest, as would probably have produced suffocation, and also in averting a degree of inflammation in the thorax, which would have proved fatal.

Mr. John Bell very judiciously condemns the seton, used by M. Guerin: "Had M. Guerin (says he) been asked what good it was to do, it would have been difficult for him to have invented even a plausible apology for the practice, which if it was not doing good, could not fail to do harm. Was this seton necessary for keeping the wound open? No, surely; for the wound could not have closed, while it was irritated, and kept in suppuration by splinters of bone, and a piece of cloth within the breast. Was it to draw the piece of cloth out? Surely, in the course of twenty days, a piece of cloth would have had some chance, at least, of being floated towards the wound, either by the natural flux of the matter, or by the help of a mild injection. Was it useful in supporting the discharge? This would have been a sore question for M. Guerin; for it supported the suppuration only by inflaming the chest; and where inflammation of the chest, or high cough, or bloody expectoration, or a profuse discharge, were the chief dangers, a great seton could hardly be a comfortable inmate in the breast. I think one might very boldly promise to produce bloody expectoration and terrible cough, profuse suppurations, and oppression, to any degree, by drawing such a cord across a sound thorax."

Mr. John Bell next censures M. Guerin for not having discovered the pricking piece of bone before the thirty-eighth day; and imputes this, in some degree, to the seton, the pain of drawing which across the chest deadened every lesser pain, and, consequently, the patient could not feel the trifling pricking of the bone, till his greater sufferings from the seton were allayed. "In short (says Mr. John Bell) M. Guerin passes a great strap of coarse linen across the cavity of the chest, and when it causes inflammation, he thinks to subdue it by bleeding; when M. Guerin continued for thirty days drawing a coarse seton through the breast every morning, and bleeding for the cough every night, what did he do, but raise inflammation with his left hand, to shew how well he could cure it with his right?" (See *John Bell on Wounds, Vol.* 2, *p.* 36—38.)

2. When one of the intercostal arteries is wounded in the track of a narrow oblique wound, the nature of the accident cannot at first be known. The blood, which the vessel pours out, commonly makes its way into the cavity of the chest, where it causes an extravasation, which is more, or less considerable. But when the wound is ample, and penetrates in a direct manner, the effused blood, which has all the characters of arterial blood, leaves no doubt, concerning the injury of an intercostal ar-

tery. However, should there still be the least uncertainty, it may easily be dispelled, by introducing the end of a finger into the wound, and making pressure with it on the lower edge of the rib, which corresponds to the vessel suspected to be injured. Some have recommended introducing, under the rib, a hollow cylindrical piece of pasteboard; and they infer, that when the blood flows through its cavity, it comes from the intercostal artery; but, that if it passes out underneath the pasteboard, it issues from the cavity of the thorax. However, besides several objections, which might be urged against this method, its adoption cannot be made, unless there be a large, open wound, in which case, the plan may be dispensed with, because the place whence the blood flows, is now visible.

Surgeons, long ago, began to exercise their industry, in devising some means for suppressing hemorrhage from the intercostal arteries, in wounds of the chest. Gerard first proposed to stop such hemorrhage, by means of a ligature. His plan was to enlarge the external wound, as far as the upper edge of the rib, corresponding to the intercostal artery, which is wounded, and then to introduce into the chest a common curved needle, armed with a ligature, to which is attached a dossil of lint. The needle is to be passed behind the rib, rather higher than the superior edge of the bone. The point of the instrument is then to be pushed, from within outward, and brought out through the external wound, together with the ligature, which follows it. When the dossil has come into contact with the artery, the two ends of the ligature are to be tied over a thick compress, placed on the outside of the rib. In this manner, the bone is surrounded with the ligature, and the artery compressed.

Goulard, a surgeon of Montpelier, having found difficulty in passing a common needle, whose shape little corresponded to the track, through which it had to pass, being curved towards its point, and straight towards the eye, had a particular one constructed for this operation. He also feared, that the former instrument, which has a sharp point, and edges, might wound the lungs. The one, which Goulard invented, formed three-fourths of a circle, and was fixed on a long handle, which facilitated its being introduced. The eye, in which the ligature is to be put, is situated near the point, which is a little blunted, and the ligature lies also in a groove, constructed along the convexity of the instrument. When this needle had passed through the intercostal muscles, and its point had made its appearance over the rib, which was above the artery, the ligature used to be untied, and held, while the needle was withdrawn at the place, where it had entered. The ligature was then tied, just in the same manner, as in Gerard's method.

Since the use of the ligature, it has been thought, that compression might answer better. Lóttery, professor of anatomy in the university of Turin, constructed, for this purpose, a steel plate, which he submitted to the inspection of the Academy of Surgery, and it is described, and engraved in the second volume, 4to. of the Memoirs of this Society. This plate, as we have said, is made of steel, and is of a long shape; narrow at one end; broad at the other; curved in two directions at its narrow part; and pierced at this place with some holes, by means of which a compress, calculated for compressing the artery, is fastened on the instrument, an opening having been first made in the situation of the wound of the vessel, for the purpose of giving vent to blood, already extravasated in the chest. The other end of the steel plate has two long parallel slits, through which a ribband is passed, in order to fasten the instrument.

This steel contrivance is used in the following manner: when the wound, corresponding to the intercostal artery, is sufficiently extensive in the transverse direction, the narrow, bent end of the instrument is to be introduced, in such a way, that the lower edge of the rib above may lie in the concavity of the curvature, and the compress press on the edge of the bone, and, of course, on the artery. The rest of the instrument applies itself to the side of the thorax, in which situation it is to be fastened. When the wound is not ample enough, a sufficient dilatation of it must be made for the introduction of the instrument.

M. Quesnay made use of a piece of ivory, which he covered with lint, &c. and then introduced within the chest. The instrument was then drawn from within outward, by means of a ribband, which was fastened to it, and thus the necessary compression was produced.

Quesnay's plan is somewhat like that invented by Lóttery. But, to have introduced the compress entirely into the thorax, together with the ivory, which was the basis of it, and then to have drawn the contrivance from within outward, as was probably intended, a very large wound would have been indispensable. This is also one of the objections to Lóttery's instrument, which, in fact, could only be employed, when there was a free and ample opening. However, there are other objections to this instrument: it obstructs the motion of the thorax; it prevents blood, extravasated in the chest, from readily making its escape, notwithstanding the opening made in the curved part of the instrument; and, lastly, it does not effectually stop the bleeding, because it does not hinder the rib from rising, against which the pressure should be made, and, consequently, the hemorrhage may then take place.

Belloque, seeing the inefficacy of all the compressing means, used before his time, and their inconveniencies, invented an instrument, which, he says, is calculated for making proper pressure, and, following the motion of the ribs, without hindering the escape of extravasated blood. The machine is engraved, and described, in 2 tom. 4to. of the Memoirs of the Royal Academy of Surgery in France. It is composed of two plates, which are wadded, and capable of being approximated, by means of a screw. This instrument, as M. Sabatier observes, does indeed promise to be completely effectual in its action; but, it is complicated, and awkward, and its utility is founded on the supposition of the wound being larger, than wounds are, which are made with common weapons.

As the object is to make pressure on the artery, it is quite unnecessary to have, for this rare accident, numerous instruments, which could seldom be at hand, and which are also liable to all the above objections. A common dossil of lint (says Sabatier), fastened to a strong ligature, and introduced between the two ribs, or even quite into the chest, and then drawn, from within outward, like Quesnay's compress, would fulfil every desirable purpose. This being done, the external wound should be covered with simple dressings, and a bandage applied round the body. The patient should be freely, and repeatedly bled, and treated on the most rigorous antiphlogistic plan; every method being adopted, which seems proper, in cases of wounds penetrating the chest, which are almost always attended with symptoms of high inflammation and irritation. The dressings should not be removed, till the wound has suppurated, and then the rest of the treatment resembles that, which becomes necessary in wounds with extravasation, of which we shall presently speak.

Professor Assalini very properly joins all the best modern surgeons in reprobating the introduction of the preceding contrivances and extraneous substances into the chest, in order to stop hemorrhage from the intercostal artery. All these methods are calculated to excite a dangerous degree of inflammation in the chest. Hence, he prefers, simply cutting the artery across, so as to allow it to retract, and if this plan fail in stopping the bleeding, he thinks it better to close the wound. Should the blood find its way into the chest, it is true, the consequences will be serious, but not fatal; and if the symptoms require it, the operation of empyema may afterwards be done. A small quantity of effused blood, however, may possibly be absorbed, and no such proceeding be requisite. (See *Assalini's Manuale di Chirurgia, p.* 58—59.)

3. The protrusion of a portion of the lungs, in consequence of wounds penetrating the chest, is a very unusual case; but there are some instances recorded by writers. Schenckius relates an example, taken from Rolandus, one of the commentators on Albucasis. Rolandus having been called to a man, who had been wounded in the thorax, six days before, found a portion of the lungs protruded, and in a state of mortification, in consequence of the compression, which it had sustained. This surgeon extirpated the part, and applied astringent powders to the wound: the patient recovered in a very little time, without any indisposition whatever remaining.

Tulpius has recorded a similar fact. A man received an extensive wound, just below his left nipple. His naturally gay disposition, however, led him to neglect the injury; and on the third day, a piece of the lungs, three finger-breadths long, protruded at the wound. The patient went to Amsterdam, whence he was distant two day's journey, for the purpose of receiving succour in one of the hospitals of that city. The protruded piece of lung, which was already mortifying, was tied, and cut off with scissars. It weighed three ounces. The wound healed in a fortnight, and the patient experienced no complaint afterwards, except a slight cough, which troubled him from time to time. The man survived the accident six years, leading a wandering, drunken life. After death, nothing particular was observed in the thorax, except that the lungs had become adherent to the pleura, in the situation of the wound. Fabricius Hildanus also relates a case, which was communicated to him by Abel Roscius. A man was wounded with a knife, between the fifth and sixth ribs, near the sternum. A piece of lung protruded through the opening, and it was wished to reduce the part; but, as it seemed to assume a livid colour, it was extirpated with the actual cautery. Having dilated the wound, and kept the ribs apart, with a wedge made of wood, the portion of lung, which had been girt by the opening, was returned. The patient after taking what were called, pectoral and vulnerary medicines, soon got well, and felt no complaints in his chest afterwards.

A fourth example of a piece of lung, making a protrusion through a wound in the thorax, is among the cases, recorded by the celebrated Ruysch. The servant of a sea-faring man was wounded in the anterior and inferior part of the chest, and was immediately attended by a surgeon, who mistook the protruded piece of lung, for a portion of omentum, and applied a tight ligature round it. Ruysch, who was called in to the case, soon detected the error, which had been committed; but, he had no apprehensions, as he was convinced, that the wound would heal very well, as soon as the tied piece of lung was detached. The event justified his prognosis, and the patient recovered.

When the piece of protruded lung is sound, and its small size will admit of its being reduced, the attempt ought to be made, without the least delay. It should be done on the same principles, as those, on which we return into the abdomen a piece of protruded intestine, or omentum. (See *Wounds of the Abdomen.*) A recurrence of the accident is to be prevented by closing the wound, and placing a compress over it. But, when the piece of lung is already in a mortified state, in consequence of the constriction, which it has suffered, or when its large size prevents reduction, Sabatier is of opinion, that the only resource is to extirpate the part, after applying a ligature round its base. If the latter step were not taken, a dangerous hemorrhage might follow, or else an extravasation of blood in the thorax. (*Médecine Opératoire, tom.* 2, *p.* 224.) However, the practice just now recommended seems very questionable: in the instance of mortification, extirpation is clearly unnecessary, as the dead part will naturally be thrown off by a spontaneous process; and, when the wound is too small to allow the part to be returned, ought it not to be dilated, rather than cut off a considerable portion, or even any, of the lung?

After the battle of Waterloo, I had a patient with a protrusion of a piece of lung four or five inches in length. The part was much bruised, and could not be easily reduced. I therefore applied a ligature round its base, and cut it off. Previously, however, I made an incision into it in order to ascertain whether it would bleed freely, which being the case, induced me to use a ligature. I was afterwards informed by Mr. Collier, staff surgeon, that the man died.

4. Emphysema is another symptom, with which wounds penetrating the chest are frequently complicated, especially, when they are small, and do not enter the thorax in a direct manner. When such wounds are small, and not straight in their course; when their track is rendered impervious either by some change in the situation of the muscles, by the swelling, by clots of blood, or by any extraneous substances; air may insinuate itself into the cellular substance, so as to cause a great deal of tumour and distention. The emphysema is easily distinguishable by the tumefaction of the part affected, without any pain, or change of colour in the skin, and by the crepitation, which is perceptible, on making the air quit the situation which it occupies, and pass into the adjoining cavities of the cellular substance. The emphysema may take place, in cases in which the lungs are not wounded, and also in others, in which they are so. In the first instance, the emphysematous swelling is caused by the external air, which insinuates itself into the cavity of the thorax through the wound, during the first inspirations, which follow the occurrence of the accident, and the same air is expelled in the subsequent acts of expiration. In the second case, the emphysema arises from the escape of air from the lungs, during inspiration, first into the cavity of the thorax, and thence, through the inner opening of the external wound, into the cellular substance.

I should have deemed it unnecessary to have said any thing in this part of the work, on the present subject, and have contented myself with referring to the article *Emphysema*, were not the cause of this symptom rather perplexing, and, did I not hope, that the following extract from Dr. Halliday's publication will tend to facilitate the comprehension of these cases. This gentleman mentions the following circumstances, under which air may escape from the lungs, or emphysema arise.

1st. "An injury or disease of the pleura pulmonalis, causing a wound or ulceration of that membrane, and thus allowing the air to escape from the lungs, as in oblique external wounds, where the outer opening, and that of the pleura costalis have healed, or closed up, and in ulcers of the surface of the lungs.

2dly. "The pleura pulmonalis, and pleura costalis, may be wounded or ulcerated, when there is no external opening, as when the ends of fractured ribs penetrate through both into the substance of the lungs; and it is from this accident, &c. that emphysema most commonly takes place.

3dy. "The common integuments of the parietes of the chest, the intercostal muscles, and the pleura costalis, may be wounded, while the pleura pulmonalis and the lungs remain uninjured, so that the air admitted from without, and collected in the cavity of the thorax, may be pressed into the cellular membrane, so as to occasion emphysema."

Dr. Halliday shortly afterwards remarks, "that the lungs in the thorax, have often, and not unaptly, been compared to a bladder in a close pair of bellows; but if we suppose the bellows to be divided into two compartments, and each of these to contain a bladder, which mutually communicate with each other, and with the external air, by means of a tube, which is exactly adapted to the nozzle of the bellows, and which admits the air only into the cavity of the bladders, and not in the space, betwixt the bladders and bellows, we shall then have a perfect representation of the mechanical structure of the thorax. The bellows will represent the thorax, divided in the middle by the mediastinum; the bladders will represent the lungs of the right and left sides; and the tube, which communicates with the bladders and with the external air, will represent the trachea. The only thing, which is wanting to render this mechanical representation perfect, is, that the bladders should exactly fill the bellows, so as to leave no air betwixt them and the bellows."

Dr. Halliday notices, that when we lift up the handle of the bellows, the bladders become filled by the external air, which rushes in through the tube, which communicates with both of them. When the handle is depressed, the air is expelled again. In the like manner, the lungs are filled with air, and emptied again when the capacity of the chest is enlarged by the inspiratory muscles, and then diminished by the expiratory ones.

When emphysema arises from a wound, or ulceration of the pleura pulmonalis, on one side of the thorax, the case is nearly the same as if an opening were made in one of the bladders, which opening would form a communication, as Dr. Halliday observes, with the bellows and bladder on one side. If this should happen, while the handle of the bellows is depressed, no sooner is the handle raised, than air rushes into the space, betwixt the bladder and bellows, and, on keeping up the handle a little while, the bladder will become quite collapsed, and the place which it occupied, while distended, will now be occupied by the air. If now, says Dr. Halliday, "we attempt to force out the air, by depressing the handle of the bellows, we shall find that this cannot be done; for, there is no direct communication, between the bellows and the external air; and, as the effused air presses equally on all parts of the collapsed bladder, it cannot escape through it."

When the thorax is expanded in inspiration, the pressure is taken off the surface of the wounded lung, and the air, which now enters this organ, instead of distending its cells, passes through its wound into the space between the pleura pulmonalis, and pleura costalis. The lung will, indeed, be partially expanded, as long as inspiration on that side goes on; the more so, the smaller its wound is. At every expiration, however, when the thorax is diminished, the effused air will be compressed against the wounded lung; but none of the air, which has escaped, can re-enter the lung again; "because (as Dr. Halliday accurately remarks) the whole of the air contained in the lung must be forced out, and then the pressure (of the air) against every part of the collapsed lung being equal, will prevent its separating any part, so as to make a passage for itself into the trachea." Thus fresh air accumulates at every inspiration in the space, between the pluræ, while none can escape from the same situation during expiration, and the quantity accumulated will, at last, equal that which is received into the other lung, during the most powerful inspiration. Dr. Halliday notices, that some authors have termed this case *thoracic emphysema;* it is clearly attended with no diffusion of air in the cellular substance, a circumstance, generally implied, when we speak of emphysema.

When both the pleura pulmonalis, and pleura costalis are wounded, the same effusion of air between these two membranes continues to take place, from the abovementioned causes, till the lung is collapsed. When an attempt is now made to expire, the injured side of the thorax must continue distended, notwithstanding every effort of the patient. However, when, in this expiratory act, the capacity of the thorax is diminished, and the air compressed, a part of it finds its way, through the wound in the pleura costalis, into the common cellular substance of the parietes of the chest.

The passage of air into the cavity of the thorax during inspiration is, as Dr. Halliday observes, now more easy, than the return of that, which is already effused in the cellular membrane, and consequently, the *subcutaneous emphysema* continues to increase with a rapidity, which is remarkable, as long as the patient lives.

To explain the origin of emphysema, in cases of wounds, which only enter the chest, and do not injure the lungs at all, Dr. Halliday has recourse to the simile of the bellows, and bladders. Were an opening made into the bellows, without injuring the contained bladders, if the access of air by this opening be more free, than that by the nozzle, communicating with the cavity of the bladder, more air will enter by the opening, than by the pipe, on the handle being raised, so that the bladder will not rise as before, when no opening in the side of the bellows existed. If the latter opening be smaller, than that of the pipe, the bladder will only be partially filled, and, on depressing the handle of the bellows, the air, contained in the bladder, and that between the bladder and the bellows, will be expelled, in the same proportion to each other, as that, in which they were formerly filled. This process would continue to go on in the same way, did not the bladder naturally collapse more and more from its gravitation. Let us now stop the mouth of the pipe, while the handle of the bellows is raised, and the bladder partially filled. On trying next to depress the handle, it results, that, as no air can escape from the pipe, that air, which is contained between the bladder and the bellows, must be first evacuated, while that, contained in the bladder of the sound side, will be forced into the bladder on the injured side, and either distend it, so as to rupture it, or cause it to protrude.

Hence, in the case of a wound, penetrating the chest, without injuring the lungs, if the air can enter more freely by the wound, than by the trachea, more of it will enter, in the act of inspiration, into the cavity of the thorax, than into the lungs. On the contrary, when the opening of the wound is not so large as that of the trachea, less air will enter the thorax, than the lungs.

In expiration, the air will be expelled from the two different situations, in proportion to the quantity, which enters each of them in inspiration, and no air at all would accumulate in the thorax, did not the lungs always tend to collapse from their gravitation. Should, however, the patient, in making an effort to expire, contract the glottis, the air, contained in the lungs of the sound side, may be propelled into the bronchia and air-cells of the lungs, on the same side as the wound, so as to distend them, and even make them protrude at the wound.

Dr. Halliday remarks, that such a protrusion often happens, when wounds are made in dogs, and has been erroneously adduced as an argument against the collapse of the lungs, when an opening is made into the thorax of the human subject. (See *Observations on Emphysema, by A. Halliday, M. D.* 1807.)

For information, concerning the treatment of the affection, the reader is referred to the article *Emphysema*, in this Dictionary.

5. We have already noticed, that wounds of the thorax may injure one of the intercostal arteries, and when the blood cannot find free vent outward, it may become extravasated in the cavity of the chest. The same consequence may follow wounds of the pulmonary vessels, those of the heart, or of the heart itself. When the hemorrage, however, takes place from vessels above a certain size, the wounded person dies almost instantaneously; but, when they are not so large, he may live for a greater or less time, and receive the succour of surgery.

The following are the symptoms, which denote an extravasation of blood in the thorax. The patient feels great oppression, and such uneasiness as will not let him long continue in one position. He experiences much difficulty, in standing up, or sitting up in his bed, unless he bends his body very much forward, in which position, the diaphragm is relaxed, and not so much dragged by the weight of the extravasated fluid. When the thighs are bent, the patient can lie with tolerable ease on his back; he is also not averse to lying on the side, on which the wound is situated; but, he cannot place himself on the opposite one, without feeling very acute pain in the situation of the mediastinum.

His respiration is short, frequent, and interrupted by sighs; his veins become empty; a mortal paleness spreads over his countenance; his extremities become cold; a viscid perspiration covers his neck and temples; his teeth chatter; his pulse becomes weak, and if, as most frequently happens, the lungs are wounded, he spits up frothy blood, and air issues from the wound.

Though one might suppose the above class of symptoms were always attendant on a considerable effusion of blood in the thorax, yet they are not so. Wounded persons have been known to die of such an extravasation, whose respiration was tolerably free, and who did not complain of suffering more inconvenience in one posture than another. Sabatier says, that several facts of this kind have fallen under his own observation. Other wounded persons, also, who have suffered most of the complaints ascribable to extravasations of blood in the thorax, have been cured by ordinary means. M. Mery gives an account of a young man, wounded in the anterior and superior part of the chest, about two o'clock in the morning, who had such difficulty of breathing, and so much fever, five hours afterwards, that M. Mery was of opinion, that an extravasation had happened, and he was thinking of making an opening for the evacuation of the blood. A tumour, which originated near the great pectoral muscle, and presented, neither the feel of fluctuation, nor that of emphysema, made him suspend his decision. Some bleedings, and the application to the tumour of compresses, dipt in a mixture of spirit of wine and water, dispersed the symptoms. This recital shews, as M. Mery has remarked, how equivocal the symptoms of an extravasation in the chest are; how difficult it is to form an opinion; and how liable to failure any operation is.

However, even the assemblage of the above symptoms, did not lead M. J. L. Petit into a mistake. Having been requested to assist at an operation, which was about to be done on a wounded man, about whose armpit, pectoralis major, and latissimus dorsi muscles, a prodigious emphysematous swelling had taken place;

whose respiration was painful and difficult; and who spit up frothy blood from his mouth; M. Petit gave it as his opinion, that it was unnecessary to make an opening into the chest. He thought, that it would be sufficient to enlarge the wound, which was at a little distance from the armpit, near the edge of the latissimus dorsi, so as to give vent to the effused air. This advice having been followed, the emphysema in a little while disappeared, and the patient soon recovered.

The equivocal nature of the symptoms of extravasations of blood in the thorax, has induced practitioners to pay the most scrupulous attention to every circumstance attendant on these cases. Valentine remarked, in several instances, that a few days after the wound, an ecchymosis occurred, at the angle of the false ribs, and spread towards the loins. The ecchymosis is described as being of a clear purple colour, like the spots, which sometimes form on the abdomen, a little while after death. Such is the difference, between this ecchymosis and that, which consists of an extravasation of blood in the cellular substance, from the rupture of blood-vessels, which makes its appearance shortly after the accident, begins close to the injury itself, and is of a deep colour, commonly spotted with some red points. Valentine advised a counter-opening to be made, in a case, in which most of the symptoms of extravasation were combined with the above sort of ecchymosis. The advice was overruled, and the patient soon afterwards died. More, than six pints of blood, were found extravasated in the thorax.

Sabatier remarks, that we cannot too highly applaud the zeal of those practitioners, who endeavour to dispel the doubts, which still prevail in several parts of surgery. At the same time, he thinks, that all, who take interest in the improvement of this science, should endeavour to ascertain the truth of any new observations, which are offered. Hence, he deems it proper to relate a case, which was communicated to him by M. Saucerotte (the father) an eminent military surgeon, and which shews, that the ecchymosis, observed by Valentine, is, at least, not invariably attendant on extravasations of blood in the chest. A carabinier, who had received a thrust with a sabre in the right side of the thorax, above the tendon of the pectoralis major, appeared to be going on very well for the first four days following the accident. On the fifth, he complained of difficulty of breathing, uneasiness, and an inability of lying on the left side, without aggravating his complaints. He complained of a great deal of pain in the region of the liver, and at the top of the shoulder. His pulse was small and contracted, and rather hard, than weak. The right side of the chest seemed larger, than the left. On the eighth and ninth day, the symptoms became more urgent, and the patient found no ease, except in leaning on his right side, and supporting himself on a chair, placed across his bed. This assemblage of symptoms indicated an extravasation of blood in the right cavity of the thorax; but, as the ecchymosis, which M. Valentine has described, was not apparent, M. Saucerotte thought that they might be deceitful. Their long continuance, however, had made him resolve to make a counter-opening, but, in the mean while, the patient died, in the night between the ninth and tenth day. When the operation was done on the dead body, a pint of putrid blood flowed out.

When the surgeon feels assured, that an extravasation of blood in the thorax has really occurred, the only indication is to make an opening for its escape. However, before undertaking this operation, the revived state of the pulse, the return of warmth in the extremities, and the cessation of convulsions, ought to denote, that the hemorrhage no longer continues from the wounded vessels. If this were not the case, a fresh quantity of blood would soon be extravasated, and the patient die exhausted. Besides, by delaying to make an opening for the discharge of the blood, we give nature time to employ her own resources. Observers have recorded instances, in which extravasations of blood in the thorax have got well, without any operation. Fabricius ab Aquapendente relates an example of a man receiving so narrow a wound in the chest, that it was impossible to make out, whether it had penetrated the pleura, or not. The spitting of blood, weight on the diaphragm, fever, and oppression, with which the patient was soon seized, removed all uncertainty. It was determined to make an opening into the chest, when a large glassful of blood came away with the urine; the pain now subsided, the fever and other complaints abated; and a speedy recovery followed.

Though Fabricius sets this case down as one of extravasation, and that it was cured, in consequence of the evacuation of blood with the urine, both inferences may, at all events, be rationally questioned.

Authors make mention of five methods of discharging collections of blood in the thorax; viz. 1st. By placing the patient in a posture, which favours the escape of the blood; 2dly. By introducing a syringe for the purpose of sucking it out, or a mere cannula, through which it is to flow; 3dly. By enlarging the wound; 4thly. By employing injections; 5thly. By making an opening into the thorax in a depending situation.

1. Success cannot be expected from

merely placing the patient in a posture, which is favourable to the escape of the extravasated blood, except when the wound is situated at the inferior part of the chest, and is large and direct in its course. Paré successfully adopted this method in the case of a soldier, who was stabbed in three places with a sword, one of the wounds, which entered the chest, being situated under the right nipple. The man was first dressed by a surgeon, who made several sutures. The patient was soon afterwards attacked with considerable difficulty of breathing, fever, coughing, spitting of blood, and acute pain in the side. Paré, who was consulted the next day, suspected, that an extravasation had happened: consequently, he cut out the sutures, and placed the patient in a position, in which his feet were much more raised, than the head. Paré also recommended him to hold his breath, and then introduced his finger into the wound, in order to take away some clots of blood, which appeared at its orifice. By these steps, the discharge of seven, or eight ounces, of fetid, coagulated blood, was effected. Injections of barley-water, in which were mixed a little honey of roses and sugar-candy, gave the patient ease, and finished the cure.

2. The idea of sucking out of the cavity of the thorax, by means of a syringe, blood extravasated in this situation, was conceived a long while ago. The pipes of all syringes, for this purpose, should have blunt ends, lest they injure the lungs. Mere tubes, containing a stilet, have also frequently been employed. In the cases, related by Scultetus, there is an example, in which an instrument of the latter sort was successfully made use of. No syringe, nor any suction with the mouth, was requisite; it was only found necessary to introduce the tube, and then withdraw the stilet.

Lamotte used only a simple cannula, which he introduced into the centre of the extravasation. Then having placed the patient in what he conceived to be the most favourable posture, and requested him to hold his breath, he drew off the collection of fluid. The cases, numbered 216, 217, 218, shew the success, which attended this method. Although it might also have answered very well in case 219, Lamotte saw, that the exceedingly high situation of the wound would not have allowed all the blood to be discharged, and, therefore, he made a counter-opening. Thus the thorax was completely emptied, and a recovery the consequence. When a cannula is employed, authors recommend it to be introduced every day, till the bad symptoms cease, and no more fluid escapes through the cavity of the instrument. After having given vent to blood, it allows a bloody serous fluid to escape, and at a later period pus, which becomes of a thicker and thicker consistence, the nearer the patient is to a recovery.

3. The cases, in which an enlargement of a wound, complicated with an extravasation in the chest, should be practised, are those, in which there is reason for thinking, that the situation is favourable for the escape of the blood. The operation is performed by introducing a grooved director, along which the knife is to be guided. The integuments, and external muscles, are to be divided in a perpendicular direction, and the intercostal muscles in a line parallel to the ribs. Care is also to be taken not to cut too near the lower edge of the upper rib, lest the intercostal artery be wounded. Dionis relates, that he practised such an operation on a soldier, who was wounded at Béfort in 1703, by the thrust of a sword below the right nipple, which made a direct opening into the thorax. As the patient was half a league from the town, his chest had become full of blood, before he could be assisted. When the extravasated fluid had been let out, Dionis made the patient lie on the wounded side, during the night, and in proportion as the blood continued to be thus evacuated, the breathing became free from oppression. The next day, the thorax was quite emptied, and the cure was so speedy, that the patient was in a state to join the army, a month afterwards.

4. The methods, which have just been explained, may be of use, when the blood retains its natural state of fluidity; but, when it has coagulated, as often happens, they can be of no avail. In this circumstance, the best plan, which can be adopted, is to inject warm water into the chest, which injection is the best calculated for loosening, and dissolving the coagula, and washing them out of the wound. A proper opening must, of course, be previously made. The French writers, even the modern ones (*Sabatier*) most absurdly recommend the injection of various detergent vulnerary decoctions, and of solutions of honey of roses, soap, salt, &c. What idea these authors can entertain of the great sensibility and tendency to inflammation of the lungs and pleura, or what good they can expect from such applications, is difficult of conception. I am firmly convinced, that the meanest scribbler on surgery, in this country, would be ashamed of being an authority for such advice.

5. When the wound is narrow, and situated at the upper part of the chest, we cannot expect to be able to give vent to the extravasated blood, without making a counter-opening at the lower part of this

cavity. The best place for making the opening, and the proper manner of executing the operation, are explained in the article, *Paracentesis of the Thorax.*

When the opening has been made, the blood makes its escape. Its exit is to be promoted by placing the patient in a posture, which makes the opening as depending as possible, and by desiring him to hold his breath.

After as much blood, as can be obtained, has been taken out, the common plan has been to maintain the opening, and not let it heal, till after a certain time.

For this purpose, the old surgeons used to employ tents, made of lint, which were proportioned to the size of the opening, being short, soft, and flattened. They had a sort of head, and a double ligature attached to them, and were often dipped in different kinds of applications. Tents have now been quite abandoned, as they are apt to bring on an inflammation of the lungs, hinder the escape of whatever fluid is contained in the chest, and cause great irritation, pain, and even exfoliations from the ribs.

Others have recommended introducing the end of a kind of wick, which, they contend, keeps open the wound, without hindering the escape of fluids. Such advice, however, is not free from objections, nor is the latter reason altogether true.

Le Dran preferred tents to wicks: he states, that the hemorrhage can only be stopped by the coagulum, which forms over the mouth of the wounded vessel. The clot is elongated, and even continued into the vessel itself, and while it remains there, no more blood is effused. In the mean while, it flows into the collateral vessels; and the mouth of the vessel closes, and includes within its parietes, the portion of the coagulum, which has formed in it. Thus the clot becomes gradually separated into two portions, one of which remains in the vessels, and acts as a sort of plug, while the other is detached with the suppuration. Hence, continues Le Dran, when a tent is introduced into the opening, which has been made, it must confine a part of the blood, which has been extravasated into the chest, and without which portion being retained, the clot would not be supported, but fall off, before the mouth of the vessel had closed, and the hemorrhage constantly continue. Without entering into an examination of Le Dran's theories of the stoppage of bleeding, a subject, which is fully explained in the article *Hemorrhage,* we may only remark, that this author's predilection for the use of tents is founded on a supposition, that the counter-opening has been made, before the hemorrhage from the vessels has ceased. Every one, however, agrees, that no steps should be taken for the discharge of the blood, contained in the thorax, before being assured, that the hemorrhage has ceased. Hence, the tent can only be regarded as hurtful. But, dismissing from consideration wicks and tents, the best means of maintaining an opening, (were such thing necessary, which cannot frequently be the case,) would be, a short cannula, with a rim to keep it from slipping into the thorax, and two little rings for confining it in its situation with a ribband. This should only just enter deeply enough to have its inner orifice on a level, or a very little further inward, than the pleura costalis, so that it may not injure, nor irritate the lungs. A plug should be kept in its outer opening, and withdrawn, as often as occasion requires, that is, as often as any material quantity of fluid collects, and requires to be discharged.

When the patient has been dressed, he is to be kept in bed, with his head and chest somewhat elevated, and his thighs bent, in which position, the breathing will be found to be least oppressed. It is usual also to recommend him to lie, as much as possible, on the side on which the operation has been done. He is to keep himself in as still, and quiet, a condition as he can. He is to be put on very low diet, and, if his strength allows, he is to be bled, and this evacuation repeated, with other antiphlogistic means, as often as the urgency of the fever and inflammatory symptoms indicates, and the strength of the constitution allows. Bleeding from the arm, besides counter-acting inflammation in the chest, which is a principal source of danger, does good by lessening the force of the circulation in the wounded vessels, and thus it diminishes the tendency to internal hemorrhage.

In keeping open wounds of the chest, the surgeon must be careful, that no tents, nor any of the dressings, glide into the cavity of the pleura. Numerous cases on record shew the necessity of using great caution, that no accident of this kind occur. Tulpius makes mention of a Danish gentleman, who had been under a careless surgeon, on account of a wound in the thorax, and who coughed up, six months afterwards, a large tent. A similar fact is recorded, among the cases collected and published by Fabricius Hildanus. A man was stabbed with a sword in the right side of the chest, near the axilla, between the second and third ribs. A great deal of blood was discharged, during the first fortnight, both from the wound, and by the mouth. The wound was successfully healed; but, the patient continued to suffer considerable difficulty of breathing, and an incessant cough, and he used to spit up a greenish, fetid matter. Three months afterwards, he coughed up two tents, which had slipped into the cavity of the thorax, from beneath the dressings, with which the wound had been covered.

In whatever condition the patient may be, any change in the antiphlogistic regimen must be made with very great circumspection. Too much nourishment, talking too frequently, and any exertion, are circumstances, which may induce a renewal of the hemorrhage, and extravasation, even after a considerable time. Vesalius saw an accident of this nature happen, a fortnight after the wound, and eleven days after the operation for empyema. A Biscayan soldier, who had been stabbed in two places with a sword above the right nipple, was attacked by fever, difficulty of breathing, restlessness, and acute pain at the bottom of the chest. These symptoms induced Vesalius to infer that an extravasation had taken place; but, he was afraid of making an opening into the chest, for fear the hemorrhage should still continue from the wounded vessels. However, as the patient remained in the same state, the fourth day after the receipt of the wounds, and his strength still lasted, Vesalius undertook the operation, by which a considerable quantity of extravasated blood was discharged. The patient felt great relief at the instant. The oozing of blood continued for a few days, after which a favourable suppuration took place in all the three wounds, and the case was, therefore, expected to end well. But, the patient having regained his strength, and taken too much food, the recurrence of hemorrhage caused his death, at the very time when he seemed to be getting well. M. Lombard, well known for some excellent productions on surgery, saw a soldier die instantaneously of internal hemorrhage, from throwing a bowl at some nine-pins, two months after he had been cured of a wound of the chest and lungs.

Authors in general advise us, before we close the wound, for the purpose of healing it, to make the patient expel the air from the chest. For this object, they advise the patient to be requested to make a strong inspiration, with the wound closed, and then a long slow expiration with it open, and so on, till as much of the air as possible is discharged, and then the wound is to be accurately closed with sticking plaster. From what we have said, however, in the article *Emphysema*, it will appear, that when there is a direct opening into the thorax, so as to admit the external air, the lungs on one side collapse, and remain so till the wound is healed, and the air absorbed. When one of these organs is wounded, a collapsed state is, indeed, the best condition, in which it can possibly be for a certain time, that is, till the breach of continuity in it has healed. All efforts to make the lung expand, by exhausting the air from the cavity of the pleura, seem unavailing; but, there is certainly no objection to not closing the wound, before as much air has been expelled in the above way, as can be thus got rid of.

Fistulæ sometimes continue for a long while after wounds of the thorax. Felix Platner mentions an instance, in which a man had in his chest a fistulous opening, out of which the air rushed with such force as to blow out a candle. He lived a long while with this disease, without suffering any particular inconvenience.

Another occasional consequence of openings made in the chest, is a hernia of the lungs, an affection, of which, Sabatier says, he is not aware, that any one has spoken. This gentleman, however, has seen such a case. A soldier, thirty years of age, who had been wounded at Rostock with a bayonet, in the right side of the chest, between the middle part of the fifth and sixth true ribs, had several bad symptoms, which he survived. The wound was succesfully healed; but, as the intercostal muscles had been divided to a great extent, and could not be approximated with precision, there remained an empty space under the integuments, which allowed a piece of the lungs, as large as a walnut, to protrude between the ribs. The swelling enlarged at the time of inspiration, and grew smaller when expiration took place. It only occasioned a slight pain, without any oppression in the chest.

The making of an opening into the chest, as already spoken of, is recommended, as Sabatier remarks, by all authors, who have treated of wounds of the chest. However, it does not appear, that the operation has been often done. Few instances are to be met with on record. J. L. Petit does not make mention of even one. Lamotte, who had the care of an infinite number of patients, never practised the operation, except twice, and, in one of these instances, it was done to let out a collection of matter in the thorax, which had occurred after a wound, which injured the lungs. Sabatier notices, that the seven volumes of the *Journal de Médecine Militaire*, which contain a collection of the most interesting cases, which have presented themselves in the military hospitals, record no example, in which it was necessary to resort to the operation in question. No instances are related in the *Mém. de l'Acad. de Chirurgie.* Sabatier says, he has enquired of many army-surgeons; but, none of them have either seen the operation done by others, or performed it themselves. M. Saucerotte, observes Sabatier, is the only one, who did it with success in a case, in which the exigency for the operation would not be expected. It was in an instance of a gun-shot wound. The necessary dilatations, and the extraction of extraneous substances, had diminished the inflammatory symptoms. These were subsiding entirely, when, on the third day, a violent hemorrhage took place from one of the branches of the internal mammary artery. This loss of blood, together with repeated venesections, did not hinder a considerable extravasation of blood in the chest from happening on the fifth day. The patient was threatened with suffocation. He was directed to bend forward, in order to promote the escape of the fluid, of which about a pint, in colour like wine-lees, and having a disagreeable smell, was discharged. A considerable quantity was in this way evacuated, every morning and evening. The posture, in which the patient was necessarily put, and the efforts he was obliged to make to promote the evacuation, fatiguing him exceedingly, he consented to have a counter-opening made, at the lower part of the chest, on the eighteenth day. The operation gave vent to a pint of blood, of the same kind as that which had issued from the wound. The quantity emitted became daily less and less, and, in three months, the patient got quite well. Sabatier questions, from what has been stated, whether we may not conclude, that the extravasations of blood in the thorax, which admit of surgical aid, are exceedingly unfrequent cases, and that the symptoms, indicative of these instances, are not sufficiently clear, so that most of the patients, with such extravasations, die, without it being possible to make any attempt to save them. (See *Médécine Opératoire.*)

### WOUNDS OF THE ABDOMEN.

In such cases, we find, that one of the chief causes of danger is the tendency of the peritoneum to inflame. Every wound which penetrates the belly is apt to excite this inflammation, and every inflammation, however slight, is prone to spread, to extend itself over all the viscera, and to terminate in gangrene and death.

There are (says Mr. John Bell) a thousand occasions, on which the delicacy of the peritoneum may be observed. The wound of the small sword, and the stab of the stiletto, explain to us, how quickly the peritoneum, and all its contained bowels, inflame from the most minute wound, although the injury be almost too small to be visible on the outside, and scarcely within; for, often, upon dissection, no intestines are discovered wounded, and no feces have escaped into the abdomen. In subjects, who die after lithotomy, we find the cavity of the peritoneum universally inflamed. The operation of the Cæsarean section is fatal, not from any loss of blood, for, there is little bleeding; nor, from the parts being exposed to the air, for, patients also die, in whom the womb bursts, and where the air has no possible opportunity of insinuating itself; but, the case proves fatal from the inflammation, which is always disposed to originate from wounds of the peritoneum, small as well as great. (*Discourses on the Nature and Cure of Wounds, p.* 310, *edit.* 3.)

But, although there can be no doubt that the wound, abstractedly considered, is the most frequent occasion of this dreaded inflammation; yet, it sometimes happens, that the inflammatory consequences must be ascribed to another kind of cause. If an intestine be wounded, its contents may, under certain circumstances, be effused in the abdomen; if the liver, spleen, kidney, or any large vessel be injured, blood may be poured out amongst the viscera; if the gall-bladder be wounded, bile may be effused; and, if the bladder be pierced, the urine may escape into the abdomen. Now all these extravasated fluids are extraneous substances, with respect to the surfaces, with which they have come into contact, and they usually give rise to inflammation of the peritoneum and viscera.

Wounds of the belly are divided, by almost all writers, into such as penetrate the cavity of the abdomen, and into others, which only interest the skin and muscles.

The former differ very much in their nature, and degree of danger, according as they do, or do not, injure parts of importance, contained in the peritoneum. The latter are not remarkably different from the generality of other superficial wounds. The chief indications are to lower inflammation, and to prevent collections of matter. A few particularities, however, in the treatment of superficial wounds of the abdomen, seem to merit attention.

### SUPERFICIAL WOUNDS.

The most ancient surgeons, and their successors, regularly up to the present day, have recorded, that wounds of tendinous parts frequently give rise to very unpleasant consequences. Almost the whole front of the abdomen is covered with tendinous expansions, and, on this account, it is not unusual to see punctured wounds in this situation followed by extensive inflammations, and the formation of abscesses. The patient is, at the same time affected, with a great deal of inflammatory fever. (See *Fever.*) He suffers acute pain, sickness, hiccough, and considerable disturbance of the nervous system. (*Callisen, Syst. Chirurg. Hodiernæ, p.* 698, *Hafniæ,* 1798, *Vol.* 1.) When the tension and swelling of the abdomen abate, shiverings sometimes occur, and indicate the occurrence of suppuration.

The matter, which forms in these cases,

sometimes accumulates in the tendinous sheath of the rectus muscle, and, when the collection in this situation remains undiscovered until a pointing appears, no sooner does the abscess burst or is it opened, than an extraordinary quantity of matter is discharged. The surgeon should carefully remember the nature of this kind of disease, as there is frequently no alteration in the appearance of the integuments to denote, either the existence, or the extent, of the suppuration.

Such an abscess forms one remarkable exception to the excellent general rule of allowing acute phlegmonous abscesses to burst of their own accord. In the present instance, there is an aponeurotic expansion, intervening between the abscess and the skin, and nothing retards the natural progress of the matter to the surface of the body so powerfully, as the interposition of a tendinous fascia. But, even in this circumstance, the propensity of pus to make its way outward is often seen to have immense influence. Though there is only a thin membrane, (viz. the peritoneum) between matter so situated, and the cavity of the abdomen, yet, in time, the abscess mostly points externally.

The proper treatment of this case is to prevent the surprising accumulation of matter, and rapid increase of mischief, by making a depending opening, sometimes at the very lowest part of the sheath of the rectus muscle, and this, as soon as the lodgment of matter is clearly ascertained.

If ever there be a case, in which it is advantageous and justifiable to make an early dilatation of a punctured wound, in order to prevent the above-described ill-consequences, it is unquestionably the present one. Such practice, indeed, is advised by the judicious Callisen, in addition to the strictest antiphlogistic means. (See *Syst. Chir. Hodiernæ, Vol.* 1, *p.* 698, *edit.* 1798.)

The matter sometimes forms between the external and internal oblique muscles, and spreads most extensively. The pus may even insinuate itself into the abdomen, and the case end fatally. Such an example is recorded by Dr. Crowther, of Wakefield. In this instance, however, the disease proceeded from a contusion, not a wound. (See *Edinb. Med. and Surgical Journal, vol. ii. p.* 129.)

Superficial wounds of the abdomen are to be treated on the same principles, as similar wounds in other situations. The indications are to prevent inflammation as much as possible, and, if suppuration should be inevitable, to let out the matter by a depending opening, as soon as the abscess is known to exist. The inflammation is to be checked by general and topical bleeding, low diet, emollient clysters, diluent beverages, quietude, opening medicines, cold applications, or fomentations and poultices, and the mildest, and most simple dressings. (See *Inflammation.*)

Whenever the abdominal muscles are wounded, it is desirable to relax them; but this object should not lead us to put the patient out of a horizontal position. A very important point, in the treatment of wounds, which interest the parietes of the abdomen, is to afford a certain degree of support to the wounded part, when there seems any chance of their being too weak to resist the pressure of the viscera. The parietes of the abdomen are almost wholly composed of soft parts, which easily yield. No part of the front, or sides, of the abdomen, is supported by the stability of a bony structure, and, as the viscera are, for the most part, more or less moveable, and closely compressed by the abdominal muscles, and diaphragm, they are extremely liable to protrude, whenever the resistance of the parietes of the abdomen is not sufficiently powerful. Thus very perilous cases of herniæ may originate.

For the above reasons, all wounds of the abdomen, especially those, in which both the integuments and muscles have been cut, demand strict attention to the precaution of supporting the wounded part, and this, though the peritoneum itself should not happen to be divided. The patient ought to keep as much as possible in a horizontal position, while suitable compresses and bandages should be applied to the situation of the wound. In order to guard against the occurrence of herniæ, the part should be supported, in this way, a considerable time after the wound is healed.

The peritoneum being connected by means of cellular substance, with the inner surface of the abdominal muscles, there is always some risk of the inflammation of these muscles extending to the membranous lining of the abdomen. This occurrence must be averted by the rigorous employment of the antiphlogistic treatment. What renders the event still more dangerous, is, that when one point of the peritoneum is affected, the inflammation usually spreads with immense rapidity over its whole extent, and too often proves fatal.

As superficial wounds of the abdomen are to be treated on the general principles, applicable to all similar wounds in other situations, it is hardly necessary to state, that union by the first intention is always to be attempted, when possible.

### OF WOUNDS PENETRATING THE CAVITY OF THE ABDOMEN.

In these cases, the first thing, which the surgeon is generally anxious to know, is, whether the wound penetrates the cavity of the abdomen, and whether any of the viscera are probably injured.

When the wound is extensive, and any of the bowels protrude, the first part of the question is at once decided. But, when the wound is narrow, and allows none of the viscera to protrude, it is often exceedingly difficult to ascertain, whether the injury extends into the abdomen, or not. An opinion, however, may usually be formed, by carefully examining the wound with one of the fingers, or a probe, after having put the patient, as exactly as possible, in the posture in which he was at the time of receiving the accident; by observing, if possible, the shape and dimensions of the instrument, with which the injury was done; how much of the weapon entered the flesh; the direction in which it was pushed; by attending to the quantity of blood, which the patient has lost, the state of his pulse, &c. and, lastly, by observing, whether there is any discharge of bile, feces, or other fluids, known to be naturally contained in some of the abdominal viscera.

When the wound is sufficiently large to admit the finger, we may always ascertain whether the injury extends into the cavity of the abdomen, because the viscera may then be easily felt. There is only one chance of deception, and that arises from a possibility of the practitioner's mistaking the inside of the sheath of the rectus muscle for the cavity of the peritoneum. When the examination is made with a probe, we should be particularly cautious in forming a judgment; for, the parts are so soft and yielding, that a very little force will make the instrument pass a considerable way inward. Every examination of this kind should always be undertaken, if possible, when the patient is exactly in the same position, as he was at the time of receiving the wound.

Injections have been employed for ascertaining, whether wounds penetrate the cavity of the abdomen. This absurd experiment, however, has now been most justly exploded from practice. It is well known to the moderns, that the space termed the cavity of the abdomen, is, in fact, completely filled with the various viscera, and that a fluid would, in general, not so easily find its way into the bag of the peritoneum, as an unreflecting person might suppose. If the injection were propelled with much force, it would be quite as likely to insinuate itself into the cellular substance, of the parietes of the abdomen, or, perhaps, into the sheath of the rectus muscle. The least tortuosity of the wound, or a piece of bowel, or omentum, lying against the internal orifice of the injury, would completely prevent an injection from passing into the abdomen.

When a considerable quantity of blood issues from a wound of the abdomen, we may pronounce, almost with certainty, that some large vessel, within its cavity, is injured. Excepting the epigastric artery, which runs on the forepart of the abdomen, along the inner surface of the rectus muscle, there is not one very considerable vessel, distributed to the muscles, and integuments. At the same time, it is deserving of particular notice, that a large artery may be opened in the abdomen, and, yet, not a drop of blood may be discharged from the external wound. A copious quantity may accumulate in this manner, even without there being any palpable swelling of the belly.

In such cases, the subsequent symptoms quickly lead us to suspect what has happened. The patient complains of extreme debility and faintness; his pulse falters; he has cold sweats; and, if the bleeding should not speedily cease, these symptoms are, in general, soon followed by death.

Sometimes, the first glimpse is enough to shew, that the wound extends into the cavity of the abdomen. The event is indicated by the escape of chyle, bilious matter, feces, or other fluids, known to be contained in some of the viscera. The same information may also be obtained from seeing a considerable quantity of blood vomited up, or discharged by stool. The urine, however, may flow from a wound, which does not actually penetrate the abdomen, for the kidneys, ureter, and bladder may be said to be out of the abdomen, because they are really on the outside of the cavity of the peritoneum.

When no symptoms of the above description occur, when neither the finger, nor probe, can be introduced; when none of the fluids, known to be contained in the various receptacles in the abdomen, are emitted from the wound; when the pulse remains natural, and the pain is not excessive; there is reason to hope, that the wound has not injured parts of greater consequence than the integuments, and muscles. (*Encyclopédie Méthodique, Partie Chirurgicale. Art. Abdomen.*)

We have now taken a survey of such criteria, as are commonly noticed by surgical writers, for the purpose of instructing the reader how to discriminate a wound which has penetrated the abdomen, from one which has not. It is our next place to warn the practitioner, that too much solicitude to determine this point, is very frequently productive of serious harm. It may be set down, as an axiom in surgery, that, *whenever the probing of a wound is not rendered absolutely necessary by some particular object in view, it may, in general, be judiciously omitted.* A narrow, oblique wound may enter the cavity of the abdomen, without there being any particular method of ascertaining, whether it has done so, or not. This, however, is of no practical importance; for, when there are no urgent symptoms, evincing the nature of the case, the treatment ought obviously to resemble that of a simple wound; and whether the wound be deep, or superficial, the antiphlogistic treatment is equally indicated.

The edges of a wound penetrating the abdomen, but, unattended with any obvious injury of the viscera, are to be brought together with sticking-plaster, just in the same way as common wounds. In this situation, sutures are not generally necessary. Numerous cases may be found in the records of surgery, proving that wounds of the abdomen may be easily united without sutures, if the surgeon take care to avail himself of the assistance which may be derived from a suitable position and a proper bandage. But, such cases are less decisive, than relations of the Cæsarean operation, the extensive wound of which admits of being healed by the same simple means. It is not here intended to say, that practitioners ventured in the majority of these examples to dispense with sutures altogether; but, the ligatures frequently cut their way through the skin and muscles, and the application of others was impossible, either on account of the particular state of the case, or the unwillingness of the patient. Still the union of such wounds was accomplished. A bandage, made on the same plan as that with eighteen tails, would be extremely convenient, for longitudinal wounds of the abdomen. (*Pibrac's Mém. in Mém. de l'Acad. de Chir. T.* 3, *4to.*)

Sutures may not only be relinquished in the treatment of wounds of the abdomen without harm, but with benefit; for it has been proved, that their employment has brought on alarming symptoms. In one instance, the hiccough and vomiting which succeeded a wound, continued notwithstanding every assistance. On the fourth day, the wound was inflamed and painful, and it was judged proper to cut away two sutures, which had been practised, and employ only simple dressings with a view of diminishing the pain and swelling. The surgeon was not deceived in his hope; for the symptoms quickly abated, and in a week were entirely cured. The wound healed very well. (*Op. cit.*)

It must not be denied, however, that there are circumstances, in which it would be impossible to dispense with sutures. If, for instance, the belly were torn open transversely from one side to the other with a bullock's horn; or if it were extensively divided with the tusks of a wild boar, a stag's horn, a razor, &c. and the inflated intestines could not be kept from protruding; some stiches would be absolutely indicated, but even then, they should be as few as possible. (*Sabatier, Médécine Opératoire, T.* 1, *p.* 214, *edit.* 2.)

"Our good old surgeon Wiseman (observes Mr. John Bell) has said with great simplicity, as a great many have said after him, "Thus, it frequently happeneth, that a sword passeth through the body, without wounding any considerable part." He means, that a rapier, or ball often passes quite across the belly, in at the navel, and out at the back, and that without one bad sign, the patient recovers, and as has very often happened, walks abroad in good health, in eight days; which speedy cure has been supposed to imply a simple wound, in which all the bowels have escaped. But, we see now, *how* this is to be explained; for, we know, that in a thrust across the abdomen, six turns of intestine may be wounded,—each wound may adhere; adhesion, we know, is begun in a few hours, and is perfected in a few days; and, when it is perfect, all danger of inflammation is over; and when the danger of inflammation is over, the patient may walk abroad; so that we may do, just as old Wiseman did in this case, here alluded to,* "Bleed him, and advise him to keep his bed and be quiet." In short, a man, thus wounded, if he be kept low, has his chance of escaping by an adhesion of the internal wounds." (*Discourses on the Nature and Cure of Wounds, p.* 329, 330, *edit.* 3.)

When a man is stabbed, or shot in the belly, the surgeon can seldom do any good by being very officious; and the wisest conduct, that he can in general adopt, is to keep his patient as quiet as possible, have recourse to bleeding, prescribe anodynes, and the lowest fluid diet, and content himself with applying superficial dressings. In the event of severe pain and swelling of the belly coming on, leeches, fomentations, and emollient poultices will be necessary, and nothing will now avail, except the most rigorous antiphlogistic means.

### SUPPURATION IN THE ABDOMEN, IN CONSEQUENCE OF WOUNDS.

Abscesses within the bag of the peritoneum are far from being common occurrences. As a late writer well observes, "the containing and contained parts of the abdomen present to each other a uniform and continuous surface of membrane. This membrane is of the serous class, and the species of inflammation, to which it is especially subject, is that, which has been denominated the adhesive. The membrane lining the intestinal canal, is of the mucous class, and the ulcerative inflammation is the species, to which this class is liable. This beneficent provision is an irresistible evidence of the operation of a salutary principle in disease. If the inflamed peritoneum had run directly into suppuration, ulceration of the surrounding parts would have been required for an outlet; and if the internal surface of the irritated bowel had tended to form adhesions, the canal would have been in constant danger of obliteration." (*Travers on Injuries of the Intestines, &c. p.* 10.)

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* P. 98. The case of a man, who was wounded across the belly, and well and abroad, in seven days.

That collections of matter, however, do sometimes take place in the cavity of the abdomen, in consequence of wounds, is a fact of which there are too many proofs on record, for the possibility of the case to be doubted. At this moment, be it sufficient for our purpose to refer to two examples of the occurrence, as related by Mr. Benjamin Bell, in his System of Surgery, vol. v. p. 256.

If the abscess were in any other part of the body, and did not readily point, the wisest practice would undoubtedly be to make an opening sufficient for the evacuation of the matter. But suppuration in the abdomen can seldom be ascertained with certainty, before the collection of matter has existed a good while: for, the situation of the abscess is so deep, that no fluctuation, nor swelling, becomes perceptible, until a considerable quantity of pus has accumulated. Besides, it would not be judicious to expose the patient to the hazard, which might arise from making an opening, into the abdomen, merely for the sake of giving vent to a small collection of matter.

Many, indeed almost all writers, impute a vast deal of the danger of wounds of the abdomen to the entrance of air into the cavity of the peritoneum, and they also adduce this as an argument against opening abscesses of the abdomen. In inculcating such opinions, however, they betray an inaccuracy of observation, which a very little reflection would have set right. Too much stress has long been laid on the introduction of air into the abdomen, as being a cause of inflammation. The fact is, that the cavity of the belly is always so completely occupied by the several viscera, that the whole inner surface of the peritoneum is invariably in close contact with them, and, consequently air cannot so easily diffuse itself from the vicinity of the wound, throughout the abdomen, as many have conceived. After tapping, in dropsical cases, we seldom see inflammation arise, though air has, in this instance, quite as good an opportunity of entering the abdomen, as in any case of a wound. The peritoneum in animals has been inflated, without any inflammation being excited. In cases of tympanitis, the peritoneum is distended with air, and yet both this membrane and the bowels are quite uninflamed. In the human subject, it seems probable, that, if a wound were made in a vacuum, the breach of continuity itself would lead to inflammatory consequences. We have also to remark, that collections of matter in the abdomen are almost always completely circumscribed, and separated from the general cavity of the peritoneum, by the adhesion of the viscera to each other, and to the inside of the peritoneum.

I am of opinion, that no surgical writer has succeeded so well, as Mr. John Bell, in exposing the absurd apprehensions, not uncommonly entertained by practitioners, respecting the entrance of air into the abdomen and other cavities of the body. He enquires: 1st, Whether air can really get into the cavity of the abdomen? and 2dly, Whether, if it were there, it would produce the dreadful effects ascribed to it?

Upon the first question, his arguments run thus: "Suppose a wound of an inch in length:—suppose the bowel to have sunk, in some strange way, into the pelvis, for example, so as to have left a mere vacuum; what should happen with the flexible parietes of the abdomen? Should they stand rigid, while the air rushed into the cavity to fill it? No, surely. But, on the contrary, the walls of the abdomen would fall together, and the pressure of the outward air, far from making the air rush in by the outward wound, would, at once, lay the belly flat, and close the wound. But, since the walls of the abdomen are not flaccid, nor the cavity empty, but the abdomen full, and the flat muscles, which cover it, acting strongly, the effect must be much more particular; for, the moment that the belly is wounded, the action of the muscles will force out part of the bowels; the continuance of that action is necessary to respiration; the respiration continues as regular after the wound, as before; and the continual pressure of the abdominal muscles and the diaphragm, against all the viscera of the abdomen, prevents the access of air so effectually, that though we should hold such a wound open with our fingers, no air could pass into the abdomen, further than to that piece of gut which is first touched with the finger, when we thrust it into the abdomen. Nothing is absolutely exposed to the air, except that piece of intestine, which is without the abdomen, or that, which we see, when we expose a small piece of the bowels, by holding aside the lips of the wound. The pressing forward of that piece, and the protrusion of a portion of the gut, proportioned always to the size of the wound; the pressure from behind keeping that piece protruded, so that it is with difficulty, we can push it back with our finger; this incessant pressure, in all directions, is an absolute security against the access of air. The intestine comes out, not like water out of a bottle, the place of which must be supplied by air entering into the bottle, in proportion as the water comes out; but, the gut is pushed down by the action of the muscular walls of the abdomen, and that action follows the intestine, and keeps it down, and prevents all access of the air whether the gut continue thus protruding, or whether it be reduced; for, if it be reduced, the walls of the abdomen yield, allowing it to be thrust back, but admitting no air. Those, who want to know the effect of air, diffused within the cavity of the abdomen, must make other experiments, than merely cutting open pig's bellies;—they must give us a fair case, without this unnecessary wound. We will not allow them to say, when they cut open the belly of any creature, with a long incision, that the inflammation arises from the air: much less shall we allow them to say, when they open the belly with a smaller incision, that, by that little incision, the air gets into the abdomen, and that all the bowels are exposed to the air." (*Discourses on the Nature and Cure of Wounds, p.* 333, 334.)

In adverting to the question, whether air is so irritating to the cavities of the body, as many have supposed, Mr. John Bell criticises, with much spirit and success, the opinions, published on this subject, by Dr. A. Monro, in his account of the Bursæ Mucosæ, as the annexed quotations will shew. "That the vulgar should believe, the first superficial impression that strikes them, of air hurting a wound or sore, is by no means surprising; but, it is not natural, that men, bred to philosophy, should allow so strange an assertion as this, without some kind of proof. That the air, which we breathe, and which we feel upon the surface so bland and delightful, should have so opposite a relation to the internal parts, that it should there be a stimulus, more acrid and more dangerous, than the urine, is not to be believed upon slight grounds. I do affirm, (says Mr. John Bell) that it remains to be proved, that this fluid, which seems so bland and pleasant to all our senses, and to the outward surface, is yet a horrible stimulus, when admitted, as a celebrated author grandly expresses it, " into the deep recesses of our body." (*Monro's Bursæ Mucosæ.*)

With how much reason, Mr. John Bell objects, that this doctrine is unfounded, will be manifest to every man of any discernment, or impartiality.

" The air, for instance, escapes from the lungs, in a fractured rib, and first goes abroad into the thorax; then into the cellular substance; then the emphysematous tumour appears; but, often, without any scarifications, with very little care and assistance on our part, the air is absorbed, the tumour disappears, and, without inflammation of the chest, or any particular danger, the man gets well. Here then is the air, within the cavity of a shut sac, filling the thorax, and oppressing the lungs, without any dangerous inflammation ensuing.

" That the air may be pushed under the cellular substance over all the body, without causing inflammation, is very plain from the more desperate cases of emphysema, where the patients, after living eight or ten days, have died, not from inflammation, but, from oppression merely, the body being so crammed with air, that even the eye balls have, upon dissection, been found as tense as blown bladders. We have also many ludicrous cases of this kind, which prove this to our perfect satisfaction. Soldiers, and sailors, sometimes touch the scrotum with a lancet, introduce a blowpipe, and blow it up to an enormous size, imitating herniæ, by which they hope to escape from the service. The old story of a man, who was so wicked as to make a hole in his child's head, and blow it up, that he might shew the child in the streets of Paris for a monster, is well authenticated; and, I have little doubt, that a fellow, who knew how to do this, would blow it up every morning, and squeeze it out when he put the child to bed at night. Some villanous butchers, having a grudge at a soldier, found him lying drunk, under a hedge; they made a little hole in his neck, and blew him up, till he was like a bladder, or, as Dr. Hunter describes the disease of emphysema, *like a stuffed skin.*" (*P.* 338, 339.)

After many other pertinent observations, blended with appropriate satire, on the extravagant notions professed by Monro on the bad effects of the air, in lithotomy, operations for hernia, and hydrocele, the Cæsarean section, &c. Mr. John Bell most justly holds up to ridicule the propositions of Dr. Aitken *to perform this last operation under the cover of a warm bath in order to exclude the air.* " This, though it may seem to be a scurvy piece of wit, was really proposed in sober serious earnest. But (adds Mr. John Bell), the admission of atmospheric air, as a stimulus, when compared with the great incisions of lithotomy, of hernia, of hydrocele, of Cæsarean section, of the trepan, is no more, than the drop of the bucket to the waters of the ocean. And it is just as poor logic to say, that, after such desperate operations, these cavities are inflamed by the admission of air, as it would be to say, (as Monro did) that when a man is run through the pericardium with a red-hot poker, that the heart and pericardium are inflamed by the admission of the air." (*P.* 347, *edit.* 3.)

Enough, I conceive, has been said, to dispel all the idle fear and prejudices, which have prevailed concerning the bad effects of the air in wounds of the abdomen, as well as several other cases. When so justly eminent a man, as Dr. Alexander Monro, senior, was disturbed with such apprehensions, it is not wonderful, that many a poor ordinary member of the profession should have been terrified nearly out of his wits upon the subject; and for quieting this alarm, and exposing its absurdities, I really think Mr. John Bell deserving of particular praise.

In general, it is an excellent rule, in all cases of wounds of the abdomen, never to be officious about abscesses, which may take place, nor concerning such viscera, as we may suspect to be injured. It is quite time enough to interfere, when the urgency of the symptoms has confirmed our conjectures. A great deal of harm is frequently done, by handling and disturbing the wounded parts more than is necessary, and, it is well known, that wounds, which are at first attended with most alarming symptoms, frequently terminate in a favourable manner. Persons have been known to have swords passed completely through their bodies, without suffering afterwards any threatening symptom, or, indeed, any effects which would authorise one to conclude, that the viscera had been at all injured. We are aware that severe inflammations may not end in suppuration, and we also know, that when pus has been formed, the fluid has been often absorbed again. Nothing then indicates the necessity for giving vent to purulent matter lodged in the abdomen, except the fluctuation and situation of the abscess be very distinct, and the quantity and pressure of the matter productive of inconveniences.

For making an opening, some writers recommend a trocar; others, a lancet. The matter must be very copious and distinct, to justify the sudden introductionof such an instrument as a trocar. It seems to me, that in all cases, the surgeon should make a cautious puncture with a lancet.

### PROTRUSION OF THE VISCERA.

The omentum and small intestines are the parts most liable to protrusion in wounds of the abdomen; but in large wounds, the great intestines, the stomach, and even the liver and spleen, may project through the opening. The *general* symptoms indicating a protrusion of the parts are sufficiently obvious; but, it deserves attention, that, in fat subjects, the adipose membrane may project from the wound, and put on somewhat of the appearance of omentum. The *special* symptoms are to be collected from a knowledge of the natural situation of the parts, and reflecting what region of the abdomen is wounded. (*Callisen, Syst. Chir. Hodiernæ, T,* 1. *p.* 702 *and* 703, *Edit.* 1798.)

Penetrating wounds sometimes allow considerable portions of the bowels, or omentum to protrude, and, though these viscera may not have received any injury, yet their being displaced in this way is sometimes productive of fatal consequences.

The best mode of preventing such a catastrophe, is to return the viscera into the cavity of the abdomen, as speedily as possible. Almost all authors recommend fomenting the displaced parts, before attempting to reduce them; but, in giving this advice, they seem to forget, that, while time is lost in this preparation, the protruded bowels suffer much more harm from exposure, and other circumstances, than they can possibly receive good from any application made to them. No kind of fomentation can be half so beneficial, as the natural warmth and moisture of the cavity of the abdomen. In order to facilitate the return of a protruded piece of intestine, or omentum, the abdominal muscles should be relaxed by placing the patient in a suitable posture, and the large intestines be emptied with a glyster. In mentioning the last measure, it is not meant, that the surgeon should delay the attempt to reduce the part, until the glyster has operated. No, this means is only enumerated as one that may become serviceable, in case the surgeon cannot immediately accomplish the object in view.—The mesentery ought always to be reduced before the intestine; the intestine before the omentum; but, the last protruded portion of each of these parts ought to be the first one reduced.

It is only when the intestine and omentum are free from gangrene and mortification, that they are invariably to be returned into the cavity of the belly, without hesitation. Also, when the protruded parts are covered with sand, dust, or other extraneous matter, it is undoubtedly proper to make them as clean as possible, before putting them back into the abdomen. For this purpose, the parts should be tenderly washed with a little lukewarm milk and water.

The two index fingers are the most convenient for reducing the parts, and, it is a rule to keep the portion first returned, from protruding again by one finger, until it has been followed by another portion, introduced by the other finger. The second piece is to be kept up, in the same way, by the finger used to return it; and so on, till the whole of the displaced parts have been put into their natural situation.

In attempting to reduce a piece of protruded intestine, the patient should be placed in the most favourable posture; the head and chest should be elevated, and the pelvis raised with pillows. Nothing can be more absurd, than the advice to have the thorax rather lower than the pelvis, in order that the weight of the viscera may tend to draw inward the protruded parts.

This is another erroneous idea, arising from the ridiculous supposition, that a great part of the abdomen is actually an empty cavity. The relaxation of the abdominal muscles is a much more rational and useful object. When this is properly attended to, and the wound is not exceedingly small, in relation to the bulk of the protruded viscera, the parts may generally be reduced by observing the above directions. But, in addition to what has been already stated, it is necessary to remark, that the pressure should be made in a straight direction into the abdomen; for, when made obliquely, towards the edges of the wound, the parts are liable to suffer contusion, without being reduced, and even to glide between the layers of the abdominal muscles, and become strangulated. When the wound is in the front of the abdomen, pressure made in this unskilful way, may easily make the viscera slip into the sheath of the rectus muscle, and cause the same perilous symptoms, as arise from an incarcerated hernia. (See *Hernia.*)

When the reduction seems complete, the surgeon should assure himself of it, by introducing his finger into the cavity of the abdomen, so as to feel, that the parts are all actually reduced, and suffer no constriction between the edges of the wound and the viscera in the abdomen.

A difficulty of reduction may arise from the protruded intestines being distended with feces, or air. In this circumstance, the contents of the gut may frequently be made to pass, by little and little, into that portion of the intestinal canal, which is within the abdomen. In order to accomplish this purpose, the surgeon must press the contents of the bowel towards the wound, and, if he succeeds in emptying the part, he will commonly experience equal success in his next attempt to replace it in the abdomen.

Sometimes, considerable pieces of intestine are found protruded, through narrow wounds of the abdomen, and their reduction cannot be effected, without doing more violence to the bowel, than its delicate structure would bear. In this case, dilating the wound becomes indispensable. However, frequently, when the reduction seems almost a matter of impossibility, on account of the smallness of the wound, relaxing the abdominal muscles, drawing a little more intestine out of the wound, and gently pressing the contents of the bowel, through the constriction into the abdomen, will render the protruded part sufficiently reducible, without any operation to enlarge the wound.

When such operation is unavoidable, the dilatation should be made in a direction, which will not endanger the epigastric artery, and if possible, in the same line as the muscular fibres.

We are also advised to make the incision upward, rather than downward, when it can be done with equal convenience, because it is supposed the first direction will be followed by less danger of hernia. (*Sabatier, Médecine Opératoire, Tom.* 1, *p.* 220, *Edit.* 2. *Callisen, Syst. Chir. Hod. T.* 1, *p.* 705.) If, however, the upper angle of the wound correspond to the direction of the suspensory ligament of the liver, writers advise making the dilatation at the lower angle, in order to incur no risk of hemorrhage from the umbilical vein. In general, it is true, this vessel is entirely obliterated in the adult, and turned into a ligamentous substance. Yet, there are some persons, in whom it continues pervious to the navel. Fabricius Hildanus saw a young man die instantaneously in consequence of a narrow stab in the belly between the false ribs and the umbilicus, and, on opening the body, he found that the sudden death had proceeded from a wound of the umbilical vein. It has been feared, also, that cutting the suspensory ligament of the liver, might give rise to such a displacement of that viscus as would interrupt the freedom of respiration, or obstruct the circulation of the blood in the vena cava. But the apprehension appears to be unfounded; for, Riolan found this ligament ruptured and retracted towards the liver in a nimble Æthiopian female dancer, whose respiration was not at all affected. (*Sabatier, Méd. Opératoire, T.* 1, *p.* 220, 221. *Edit.* 2.)

On account of the possibility of the urachus being pervious, we are likewise recommended to avoid cutting it, if the dilatation can be well made in another direction. (*Callisen, op. cit. p.* 705.)

I believe few surgeons of the present day in England will be inclined to attach any importance to the preceding cautions, respecting the urachus and suspensory ligament of the liver.

It would be unpardonable to make a more extensive incision, than absolutely requisite, as herniæ are very much disposed to occur, wherever the peritoneum has been divided. The operation may be done with a curved bistoury and a director, much in the same way as is done in cases of strangulated ruptures. (See *Hernia.*)

After the battle of Waterloo, we had many cases, in which parts of the bowels and omentum were protruded, and in several, the reduction could not be effected, till the wounds had been enlarged in the way above recommended. So tightly also were the parts girt, that the operation was in several instances far from being easy.

Instead of enlarging wounds of the abdomen, it has been proposed to let out the air from the intestines, by making small punctures with the point of a needle, and thus lessen a volume of the protruded part sufficiently to render it easily reducible. This suggestion first originated with Ambroise Paré, who declares, that he has several times practised the method with success. Rousset, his cotemporary, also informs us, that the plan was adopted by another surgeon, in an instance, where the epigastric region was wounded, and a large portion of the intestines was protruded and strangulated. Peter Lowe, an English surgeon, likewise assures us, that he has frequently pursued such practice, when other means failed. Garengeot, Sharp, and Van Swieten, are all advocates for Paré's proposal; but they recommend employing a round needle, which will merely separate the fibres of the intestinal canal, without cutting them, as a flat, triangular, sharp-edged needle would unavoidably do. These last celebrated writers however, only sanction the practice, when the quantity of protruded intestine is exceedingly great, and when it is so enormously distended with air, that it would be impossible to reduce the part, though the wound were enlarged, and every thing else, likely to promote the reduction, were put in practice. But, as the judicious Sabatier has remarked, the punctures must be entirely useless, if made with a fine needle, since they will be immediately stopped up with the mucous secretion, with which the inside of the bowels is constantly covered; and if the punctures are made with a broad triangular needle, or a very large round one, as Desault and Chopart have advised, they must be highly dangerous, inasmuch as they must be extremely likely to give rise to inflammation, and even to extravasation within the abdomen. (See *Médecine Opératoire, Tom.* 1. *p.* 10.)

That small punctures in the bowel would not answer the purpose, but be obstructed by the villous, or mucous coat, is a fact, which has been for a long time well known to surgeons. Callisen, amongst others, has particularly noticed it: "acu puncturæ enim flatibus exitum parare nequeunt, siquidem tunica villosa foraminula obstruit," &c. (*Syst. Chir. Hod. T.* 2. *p.* 704.)

It was the circumstance of small punctures being unavailing, that led Desault and Chopart to recommend the use of a large round needle, "*pour que l'ouverture ne soit point bouchée par les mucosités dont les intestines sont enduits.*" But, they were also aware of the danger of employing such an instrument, since they give us directions how to proceed, in order to prevent extravasation and inflammation: "*On pré viendra l'epanchement des matieres stercorales en passant, avant de reduire l'intestin, une anse de fil dans la portion de mesentère qui répond à la piqure pour la fixer contre les bords de la plaie extérieure, et l'on combattra par les remèdes, généraux l'inflammation que cet piqure peut attirer.*" (*Traité des Maladies Chirurg. Tom.* 2, *p.* 135.) One of the most eminent surgeons of Paris at the present time is an advocate for puncturing the bowel, for which operation he boldly recommends a small hydrocele trocar. (*Richerand, Nosographie Chir. T.* 3, *p.* 336, *Edit* 4.)

Mr. Travers, one of the latest and best writers upon this subject, most properly joins in the condemnation of the plan of pricking the protruded bowels. "Blancard and others protested against this practice, on the very sufficient ground of its inefficacy. La Faye very truly says, it is a useless as well as dangerous practice; for the openings, made by a round needle, cannot give issue to the contained air." Mr. Travers then cites two cases, shewing that even small stabs in a bowel will not prevent its becoming distended with air.

"A man was brought to St. Thomas's hospital, on Saturday, the 30th of June last (1811), who had been stabbed in the direction of the epigastric artery, on the left side of the abdomen, by a case knife. He died in eighteen hours, apparently from the sudden and copious hemorrhage, which had taken place within the belly. About half a yard of ileon was protruded. The gut was highly discoloured, and so much distended, notwithstanding it was pierced in three places, that the wound of the integuments required to be freely dilated, before it could be returned. *The apertures were in fact obliterated by the mucous coat.*"

"It appeared upon the trial of Captain Sutherland (Ann. Reg. June 1809) for the murder of his cabin boy, that the intestines had been extensively protruded through a wound near the left groin, and had lain exposed for four or five hours—that the dirk had pierced through one fold of intestine, and entered another—that the wound of the intestine was *half an inch* long, that the reduction could not be accomplished until the parietal wound was dilated; and that the intestine was then returned, and the integuments sewed up." (*Travers on Injuries of the Intestines, p.* 174, 176).

I must observe, however, with respect to this last case, that it does not satisfactorily prove what the author intends it to shew, namely, *that the bowel was distended with air, though there was a wound in it half an inch long,* for, the evidence does not inform us, that the difficulty of reduction was owing to this cause. I have seen a very small portion of omentum protruded through a wound, and baffle all endeavours to reduce it for nearly an hour. The first case, adduced by Mr. Travers, however, is more explicit and interesting; and we are to infer from it, and the observations of Haller, Callisen, &c. that the punctures, made in an intestine, are not closed by mucus, as Sabatier and Desault have asserted, but by the mucous coat itself.

As the above expedient had been recommended by writers of some weight, I thought that the subject should not be passed over in silence, and without a caution to the reader, never to put any confidence in the method. The plan does not facilitate the business of the operator; there is not even this solitary reason in favour of the practice; and though it may have answered when large needles were used, and some patients, so treated, may have recovered; yet, every person, who has the least knowledge of the animal economy, will easily comprehend, how even the smallest opening, made in parts, so irritable and prone to inflammation, as the bowels, must be attended with greater danger than would result from enlarging a wound of the skin and muscles. Besides the air may frequently be pressed out of the intestine in a safer way, as I have already described.

A wound of the abdomen, attended with one of the most considerable protrusions of the viscera, that I have ever read of, is recorded by Mr. Hague, surgeon at Ripon: "August 30th 1808 (says this gentleman) I went to Norton Mills, about four miles from hence, to see John Brown, æt. 12 years, who had received a wound in the abdomen by a wool shears. On my arrival, which was little more than an hour after the accident, I found the poor lad in a very distressing situation; the *great arch of* the stomach, and the *whole of the intestinal canal*, (duodenum excepted) contained within the abdomen, having protruded through the wound. The incision was on the left side of the body, commencing at about two inches below the scrobiculus cordis, and extending in a straight line near four inches in length, distant from the navel two inches, and he was quite sensible, and had vomited so as to empty the stomach; very little blood was lost. I immediately proceeded very carefully to examine the protruded viscera, none of which were wounded, and reduced them as quickly as possible, beginning with the stomach, and following the regular course of the intestines, in the latter portion of which, I distinctly felt feces, of rather firm consistence. He complained of some pain, during the reduction, though not much, and expressed great relief, when the parts were completely returned. I now desired an assistant to lay the palm of his hand over the wound, and make some pressure upon it; for, I found, that, without this, the parts would soon have protruded again by the action of respiration, which was oppressed and laborious. I brought the sides of the wound together by five sutures, beginning from above downwards, and passed the needle on each side, quite through the integuments with the peritoneum, &c. The wound was also dressed with adhesive plaster, and covered with a bandage." (Vide *Edinburgh Medical and Surgical Journal, Vol.* 5, *p.* 129, *&c.*)

This case is really an interesting one; for, notwithstanding so unlimited a protrusion of the viscera, and the parts had been left unreduced for more than an hour, a recovery ensued, under the judicious employment of bleeding, purging, anodynes, &c.

In la Caserne de St. Elizabeth, at Brussels, after the battle of Waterloo, the number of protrusions of the viscera, which fell under my notice, were much more considerable, than what I previously had any idea of ever meeting with. I well remember in my own part of the hospital, two protrusions of a large portion of the stomach; three of the bladder; and ten or twelve of the mesentery, omentum, or intestines.

When the protruded intestine is wounded, the opening is to be closed with a particular suture, before the part is returned into the abdomen. Of this subject, when we speak of wounds of the intestines.

Some of the exposed intestine may have mortified, before the arrival of surgical assistance. This event is exceedingly rare in cases of wounds, but, is not uncommon in those of strangulated herniæ. The treatment is explained in the article *Hernia.*

When the protruded intestine is in a state of inflammation, its immediate reduction is, beyond all dispute, the means most likely to set every thing right. Even when the inflammation has risen to a vehement pitch, a timely reduction of the displaced part, and the employment of antiphlogistic means will often prevent gangrenous mischief. The dull, brown, dark red colour of the intestine may induce the practitioner to suppose, either that the part is already mortified, or must inevitably become so, and, consequently, he may delay returning it into its natural situation. But, notwithstanding this suspicious colour of the intestine, its firmness will evince, that it is not in a state of gangrene. The ultimate recovery of a portion of intestine, so circumstanced, is always a matter of uncertainty; but, the propriety of speedily replacing the part in its natural situation is a thing most certain. "Partes egressæ sanæ (observes Callisen) citissime sunt reponendæ, neque obstat mutatio coloris nativi in rubrum subfuscum." (*Syst. Chir. Hod. T.* 1, *p.* 703, *Edit.* 1798.) In case the bowel should mortify after being reduced, all hopes of the preservation of life are not to be abandoned; as we have noticed in the subject of hernia, where many things necessary to be known concerning the mode of reducing protruded omentum, will also be found.

When a piece of intestine cannot be reduced, granulations and new skin may grow over it, as the experience of Callisen confirms. (*Op. cit. p.* 706.)

The protruded viscera having been reduced, the next object is to retain them in the abdomen, until the wound is completely healed. When the wound is small, this is a matter of no difficulty; in this instance, it is enough to put the patient in such a position, as shall relax the fibres of the wounded muscles, while the edges of the wound are maintained in contact with sticking-plaster, and supported, in this way, by a compress and bandage. Costiveness is to be removed by the mildest purgatives, such as the soda phosphorata and oleum ricini, or by laxative glysters, which are still preferable. But, in cases of extensive wounds, even when the treatment is conducted with all possible judgment, it is occasionally difficult, and even impossible, to hinder the protrusion of the bowels by common dressings, and a bandage. In this circumstance the edges of the wound must be sewed together by a particular suture, named *Gastroraphe*. (See this article). It is proper to remark, however, that, in modern times, this suture is very rarely employed, in comparison with what it was formerly, and, in the description of gastroraphe, some remarks are offered, for the purpose of proving, that the generality of wounds of the abdomen do not require any suture whatsoever.

When the omentum protrudes at a penetrating wound, and is strangulated by the narrowness of the opening, it soon contracts adhesions to it, if not speedily reduced. Should such connexion be already formed, when the surgeon is first consulted, we are advised to cut off the portion, which exceeds the level of the integuments, and to leave the rest in the wound. The latter will block up the opening, and have the good effect of preventing the occurrence of hernia. (*Richerand, Nosographie Chirurgicale, Tom.* 3, *p.* 339, *Edit.* 4.) When the protruded omentum is sound and free from adhesions, it ought to be reduced without delay. But, when the protrusion is large, and there is reason to fear, from the vomiting and the pains shooting from the wound to the epigastric region, that the stomach is dragged, the displaced part must be made free, and, if sound, reduced. Should it be in a mortified state, however, the dead part must be previously cut away, and any vessels, which bleed, tied separately with a piece of fine thread, or silk, both ends of which may either be cut off close to the knot, and the part then reduced; or one end may be left out of the wound, and the other cut away. Practitioners, who apprehend ill effects from leaving within the abdomen so small a particle of extraneous matter, as the little knot of fine thread, will prefer the last method, and withdraw the ligature altogether as soon as it becomes loose.

### EXTRAVASATION IN THE ABDOMEN.

Wounds of the abdomen may be complicated with extravasations of blood, chyle, excrement, bile, or urine. None of these complications, however, are half so frequent, as an unreflecting and inexperienced practitioner might apprehend. The employment of the phrase *cavity of the abdomen* has paved the way to much erroneous supposition upon this subject, and has induced many absurd notions, which even the sensible observations, long ago published by Petit (le fils), have scarcely yet dispelled.

As a modern writer has observed: "there is not truly any cavity in the human body, but, all the hollow bowels are filled with their contents, all the cavities filled with their hollow bowels, and the whole is equally and fairly pressed. Thus, in the abdomen, all the viscera are moved by the diaphragm and the abdominal muscles upwards and downwards, with an equable continual pressure, which has no interval; and one would be apt to add, the intestines have no repose, being kept thus in continual motion; but, though the action of the diaphragm, and the reaction of the abdominal muscles are alternate, the pressure is continual; the motion, which it produces, (they produce) is like that which the bowels have, when we move forwards in walking, having a motion, with respect to space, but none with regard to each other, or to the part of the belly, which covers them; the whole mass of the bowels is alternately pressed, to use a coarse illustration, as if betwixt two broad boards, which keep each turn or intestine in its right place, while the whole mass is regularly moved. When the bowels are forced down by the diaphragm, the abdominal muscles recede: when the bowels are pushed back again, it is the reaction of the abdominal muscles, that forces them back and follows them; there is never an instant of interruption of this pressure, never a moment, in which the bowels do not press against the peritoneum; nor is there the smallest reason to doubt, that the same points in each are continually opposed. We see, that the intestines do not move, or, at least, do not need to move in performing their functions; for, in hernia, where large turns of intestines are cut off by gangrene, the remaining part of the same intestines is closely fixed to the groin, and yet the bowels are easy, and their functions regular. We find the bowels regular, when they lie out of the belly, in hernia, as when a certain turn of intestine lies in the scrotum, or thigh, or, in a hernia of the navel; and where yet they are so absolutely fixed, that the piece of intestine is marked by the straitness of the rings. We find a person, after a wound of the intestine, having free stools for many days; and what is it, that prevents the feces from escaping, but merely this regular and universal pressure? We find a person, on the fourth or fifth day, with feces coming from the wound! a proof, surely, that the wound of the intestine is still opposite, or nearly opposite, to the external wound. We find the same patient recovering without one bad sign! What better proof than this could we desire, that none of the feces have exuded into the abdomen?

"If in a wound of the stomach, the food could get easily out by that wound, the stomach would unload itself that way, there would be no vomiting, the patient must die; but, so regular and continual is this pressure, that the instant a man is wounded in the stomach, he vomits, he continues vomiting for many days, while not one particle escapes into the cavity of the abdomen. The outward wound is commonly opposite to that of the stomach, and, by that passage, some part of the food comes out; but when any accident removes the inward wound of the stomach from the outward wound, the abdominal muscles press upon the stomach, and follow it so closely, that if there be not a mere laceration extremely wide, this pressure closes the hole, keeps the food in, enables the patient to vomit, and not a particle, even of jellies, or soups, is ever lost, or goes out into the cavity of the belly.

"How (proceeds Mr. J. Bell) without this universal and continual pressure, could the viscera be supported? Could its ligaments, as we call them, support the weight of the liver? Or, what could support the weight of the stomach when filled? Could the mesentery, or omentum, support the intestines; or could its own ligaments, as we still name them, support the womb? How, without this uniform pressure, could these viscera fail to give way and burst? How could the circulation of the abdomen, go on? How could the liver and spleen, so turgid as they are with blood, fail to burst? Or what possibly could support the loose veins and arteries of the abdomen, since many of them, e. g. the splenic vein, is, (are) two feet in length, is (are) of the diameter of the thumb, and has (have) no other, than the common pellucid and delicate coats of the veins? How could the viscera of the abdomen bear shocks and falls, if not supported by the universal pressure of surrounding parts? In short, the accident of hernia being forced out by any blow upon the belly, or by any sudden strain, explains to us how perfectly full the abdomen is, and how ill it is able to bear any pressure, even from its own muscles, without some point yielding, and some one of its bowels being thrown out. And the sickness and faintness, which immediately follow the drawing off of the waters of a dropsy, explain to us, what are the consequences of such pressure being even for a moment relaxed. But, perhaps, one of the strongest proofs is this, that the principle must be acknowledged, in order to explain what happens daily in wounds; for, though in theory we should be inclined to make this distinction, that the hernia, or abscess of the intestines, will adhere and be safe, but, that wounded intestines, not having time to adhere, will become flaccid, as we see them do in dissections, and so, falling away from the external wound, will pour out their feces into the abdomen, and prove fatal; though we should settle this, as a fair and good distinction in theory, we find, that it will never answer in practice. Soldiers recover daily from the most desperate wounds; and the most likely reasons, that we can assign for it, are, the fulness of the abdomen, the universal, equable, and gentle pressure; and the active disposition of the peritoneum, ready to inflame with the slightest touch. The wounded intestine is, by the universal pressure, kept close to the external wound, and the peritoneum and the intestine are equally inclined to adhere. In a few hours, that adhesion is begun, which is to save the patient's life, and the lips of the wounded intestine are glued to the lips of the external wound. Thus, is the side of the intestine united to the inner surface of the abdomen; and, though the gut casts out its feces, while the wound is open; though it often casts them out more freely, while the first inflammation lasts; yet, the feces resume their regular course, whenever the wound is disposed to close." (*John Bell's Discourses on Wounds, p.* 323, 327, *edit.* 3.)

The foregoing extract, though drawn up in the most careless style, contains such observations, as are well calculated to make the reader understand, that the abdomen is in reality not a cavity, but a compact mass of containing and contained parts; that the close manner, in which the various surfaces are constantly in contact, must powerfully oppose extravasations; and that, in fact, it often entirely prevents them. The passage cited impresses us with the utility of that quick propensity to the adhesive inflammation, which prevails throughout every peritoneal surface, and which not only often has the effect of permanently hindering effusion of the contents of the viscera, by agglutinating the parts together, but which, even when an extravasation has happened, beneficially confines the effused fluid in one mass, and surrounds it with such adhesions of the parts to each other, as are rapid in their formation, and effectual for the purposes of limiting the extent of the effusion, and preventing the irritation of the extravasated matter from affecting the rest of the abdomen.

It is to M. Petit that we are indebted for the introduction of more correct modes of thinking upon the foregoing subject, and, as his valuable observations in the *Mem. de l'Acad. de Chirurgie,* are highly interesting, they have been introduced into this Dictionary, in the article, *Extravasation,* to which, for the present, I shall be content with referring.

But, notwithstanding the influence of the reciprocal pressure of the containing and contained parts against each other, and the useful effect of the quickly arising adhesive inflammation, in all penetrating wounds of the belly, complicated with the injuries of the viscera, we are not to suppose, that extravasation never happens; but, only that it is much less frequent than has been commonly supposed. Mr. Travers, with much laudable industry, has endeavoured to trace more minutely, than any preceding writer, the particular circumstances, under which effusions in the abdomen are likely or unlikely to happen. "It being admitted (says he) that there are cases, in which effusion does take place, it is easy to conceive circumstances, which must considerably influence this event. If, for example, the stomach and bowels be in a state of emptiness, the nausea, which follows the injury, will maintain that state. If the extent of the wound be considerable, the matter will more readily pass through the wound, than along the canal. A wound of the same dimensions in the small and the large intestines, will more readily evacuate the former, than the latter, because it bears a larger proportion to the calibre. Incised and punctured wounds admit of the adhesion of the cut edges, or the eversion of the internal coat of the gut, so as to be in many instances actually obliterated; whereas, lacerated, or ulcerated openings, do not admit of these salutary processes. Again, in a transverse section of the bowel, contraction of the circular fibre closes the wound, whereas in a longitudinal section, the contraction of this fibre enlarges it. Such (says Mr. Travers) are the circumstances, which combined, in a greater or less degree, increase or diminish the tendency to effusion." (*On Injuries of Intestines, &c. p.* 13—14.)

After the details of some experiments and cases, the preceding author makes among other conclusions, the following:

1. That effusion is not an ordinary consequence of penetrating wounds.

2. That, if the gut be full and the wound extensive, the surrounding pressure is overcome, by the natural action of the bowel tending to the expulsion of its contents.

3. That, if food has not recently been taken, and the wound amounts to a division of the gut, or nearly so, the eversion and contraction of the orifice of the tube, prevent effusion.

4. That, if the canal be empty at the time of the wound, no subsequent state of the bowel will cause effusion, because the supervening inflammation agglutinates the surrounding surfaces, and forms a circumscribed sac; nor can effusion take place from a bowel at the moment full, provided it retains a certain portion of its cylinder entire, the wound not amounting nearly to a semidivision of the tube, for then the eversion and contraction are too partial to prevent an extravasation.

5. That, when however air has escaped from the bowel, or blood has been extravasated in quantity within the abdomen at the time of the injury, the resistance, opposed to effusion, will be less effectual, although the parietal pressure is the same, as such fluids will yield more readily, than the solids naturally in contact. *P.* 25—26, 100.

6. That, though extravasation is not common in penetrating wounds, it follows more generally in cases, where the bowel is ruptured by blows, or falls upon the belly, while the integuments continue unwounded. *P.* 36.

7. That when the bowels are perforated by ulceration, there is more tendency to effusion, than in cases of wounds. *P.* 38, &c.

Mr. Travers attempts to explain the reason of the greater tendency to effusion, in cases of intestine burst by violence, and in those of ulceration, "by the difference in the nature of the injury, which the bowel sustains, when perforated by a sword or bullet, as in the one case, or burst or ulcerated in the other. A rupture by concussion could only take place under a distended state of the bowel, a condition most favourable to effusion, and from the texture of the part, a rupture, so produced, would seldom be of limited extent. The process of ulceration, by which an aperture is formed, commences in the *internal* coat of the bowel, which has always incurred a more extensive lesion, than the peritoneal covering. The puncture, or cut, is merely a solution of continuity in a point, or line; the ulcerated wound is an actual loss of substance. The consequence of this difference is, that, while the former, if small, is glued up by the effusion from the cut vessels, or, if large, is nearly obliterated, by the full eversion of the villous coat, the latter is a permanent orifice." *P.* 46.

How much Mr. Travers and Mr. John Bell differ in opinion, upon these latter points, will appear from the following passage: after adverting to the adhesion, which takes place between the viscera and the peritoneum, under a variety of circumstances attending disease, Mr. John Bell observes: "this it is, which makes the chief difference, in point of danger, betwixt an ulcerated and a wounded intestine; for, in a wound, there is, as we should suppose, no time for adhesion, nothing to keep the parts in contact, no cause, by which the adhesion might be produced. But, in an ulcer, there is a slow disease, tedious inflammation, adhesion first, and abscess, and bursting afterwards; sometimes a fistula remains discharging feces, and sometimes there is a perfect cure. If a nutshell, a large coin, a bone, or any dangerous thing be swallowed, it stops in the stomach, causing swelling and dreadful pain; at last, a hard firm tumour appears, and then it suppurates, bursts, the bowel opens, the food is discharged at every meal, till the fistula gradually lessens, and heals at last. But, where the stomach is cut with a broad wound of a sabre, the blood from the wounded epiploic vessels, or the food itself, too often pours out into the abdomen, and the patient dies," &c. (*Discourses on Wounds, p.* 321, *edit.* 3.) The author afterwards proceeds to explain, how the compact state of the containing and contained parts, and the incessant and equable pressure, which the viscera sustain, frequently hinder effusion in cases of penetrating wounds.

Which of these gentlemen is most correct on the subject, I cannot pretend to say. Mr. Travers has certainly adduced a few cases, in favour of his own statement. Whether they are deviations from what is most common, can only be decided by a comparative examination of a greater number of facts. When the intestines ulcerate, and thus rid themselves of foreign bodies, the general tenor of the cases on record undoubtedly affords us little reason to be apprehensive of extravasation. Yet, with respect to ulceration of the intestines from other causes, circumstances may be very different.

Mr. Travers's account of the subject has very lately received some confirmation from an interesting case, published by Dr. John Crampton, assistant physician to Steevens' Hospital, Dublin. It is an instance of rupture of the stomach, and fatal effusion of its contents into the cavity of the abdomen. The patient was a young lady, aged 29. She was suddenly taken ill with spasm in her stomach, and other severe symptoms, and died in about twelve hours. "On opening the abdomen, the stomach was observed to be pale, flaccid, and empty. Its contents, amongst which were recognized oatmeal and castor oil, had escaped into the cavity of the abdomen, through a round aperture situated on its anterior surface, at the union of the cardiac and pyloric portions. This perforation of the stomach was perfectly circular, about the size of a pea, and appeared to be the result of an ulcer on the mucous surface, which had gradually penetrated the other coats. This ulcer was hollow and circular, nearly the size of a shilling, and had the appearance, as if it had been made with caustic, with the orifice in its centre." (*J. Crampton in Med. and Chir. Trans. Vol.* 8, *p.* 230.) To the preceding, Mr. Travers has annexed some additional facts: one is an example of a rapidly fatal effusion of the intestinal contents, through an ulcerated opening about a finger's breadth below the pylorus. The foramen had a peritoneal margin, and proved to be the centre of an irregular superficial ulcer of the mucous coat. Another case is that of a similar ulceration of the small intestines, and fatal extravasation of their contents. In another example, a circular aperture of the peritoneum, large enough to admit a crow's quill, was found after death at the junction of the duodenum and stomach. It also was the centre of an ulcer, that had destroyed the villous and muscular coats of the bowel to the extent of half an inch. For many other ingenious observations, I must refer the reader to Mr. Travers's paper, who concludes with remarking, that the chief diagnostic symptoms of these hopeless cases appear to be:

1. Sudden, most acute, and unremitting pain, radiating from the scrobiculus cordis, or the navel, to the circumference of the trunk, and even to the limbs. A peculiar pain, the intensity of which, like that of parturition, absorbs the whole mind of the patient, who, within an hour from the enjoyment of perfect health, expresses his serious and decided conviction, that if the pain be not speedily alleviated, he must die.

2. Coeval with the attack of pain, remarkable rigidity and hardness of the belly, from a fixed and spastic contraction of the abdominal muscles.

3. A natural pulse for some hours, until the symptoms are merged in those of acute peritonitis, and its fatal termination in the adhesive stage. (*Travers, in Med. and Chir. Trans. Vol.* 8, *p.* 231, *et seq.*)

Blood is more frequently extravasated in the abdomen, than any other fluid. Extravasations of this kind, however, do not invariably happen, whenever vessels of not a very considerable size are wounded. The compact state of the abdominal viscera, in regard to each other, and their action on each other, oppose this effect. The action alluded to, which depends on the abdominal muscles and diaphragm, is rendered very manifest by what happens, in consequence of operations for herniæ attended with alteration of the intestines, or omentum. If these viscera should burst, or suppurate, after being reduced, the matter which escapes from them, or the pus, which they secrete, is not lost in the abdomen; but is propelled towards the wound of the skin, and there makes its exit. The intestinal matter, effused from a mortified bowel, has been known to remain lodged the whole interval, between one time of dressing the wound and another, in consequence of the surgeon stopping up the external wound with a large tent. When the abovementioned action or pressure of the muscles, is not sufficient to keep the blood from making its escape from the vessels, still it may hinder it from becoming diffused among the convolutions of the viscera, and thus the extravasation is confined in one mass. The blood, effused and accumulated in this way, is commonly lodged at the inferior and anterior part of the abdomen, above the lateral part of the pubes, and by the side of one of the recti muscles. The weight of the blood may propel it into this situation, or perhaps, there may be less resistance in this direction, than in another. In opening the bodies of persons, who have died with such extravasations, things may put on a different aspect, and the blood seem to be promiscuously extravasated over every part of the abdomen. But, when such bodies are examined with care, it will be found, that the blood does not insinuate itself among the viscera, till the moment when the abdomen is opened, and the mass previously lies in a kind of pouch. This pouch is frequently circumscribed, and bounded by thick membranes, especially when the extravasation has been of some standing. (*Sabatiér Médecine Opératoire, Tom.* 1, *p.* 28—30.)

It is of the highest consequence to a practical surgeon to remember well, that all the parts contained in the abdomen are closely in contact with each other, and with the inner surface of the peritoneum. This is one grand reason, why extravasations are seldom so extensively diffused as one might imagine; but, commonly lie in one mass, as Petit, Sabatier, and all the best moderns have noticed. The pressure of the elastic bowels, of the diaphragm, and abdominal muscles, not only frequently presents an obstacle to the diffusion of extravasated matter, but often serves to propel it towards the mouth of the wound. The records of surgery make mention of numerous instances, in which persons have been stabbed through the body, without any fatal consequences, and sometimes without the symptoms being even severe. In Mr. Travers's publication many cases, exemplifying this observation, are quoted from a variety of sources; Fab. Hildan. Obs. Chirurg. Cent. 5. Obs. 74. Œuvres de Paré, liv. 10, Chap. 35. Wiseman's Surgery, p. 371. La Motte's Traité Complet de Chirurgie; &c. &c. In such cases the bowels have been supposed to have eluded the point of the weapon, and this may perhaps in a few instances have been actually the fact; but, in almost all such examples, there can be no doubt, that the bowels have been punctured, and an extravasation of intestinal matter has been prevented by the opposite pressure of the adjacent viscera. Such resistance and pressure may, also, have occasionally obliged intestinal matter, or blood, actually extravasated, to pass through the wound of the bowel into its cavity, and thus be speedily removed. Certain it is, such copious evacuations of blood *per anum* have followed stabs of the abdomen, as could hardly proceed from the arteries of the intestines. This way of getting rid of an extravasation must be rare, however, compared with that by absorption.

The pouch, or cyst, including extravasated blood, or matter, as mentioned by Sabatier, is formed by the same process, which circumscribes the matter of abscesses. (See *Suppuration.*) It is, in short, the adhesive inflammation. All the surfaces in contact with each other, and surrounding the extravasation, and track of the wound, generally soon become so intimately connected together by the adhesive inflammation, that the place in which the extravasation is lodged, is a cavity entirely destitute of all communication with the cavity of the peritoneum. The track of the wound leads to the seat of the effused fluid, but has no distinct opening into the general cavity of the abdomen. The rapidity with which the above adhesions form is often very great, almost incredible.

It should be known, however, that extravasations are occasionally diffused in various degrees among the viscera, owing to the patient being subjected to a great deal of motion, or his having violent spasmodic contractions of the intestines, arising from the irritation of the extravasated matter. Urine and bile are more frequently dispersed to a great extent among the abdominal viscera, than blood. The latter fluid, indeed, must often coagulate; a circumstance that must tend both to stop further hemorrhage, and confine the extravasation in one mass.

### SYMPTOMS AND TREATMENT OF EXTRAVASATIONS IN THE ABDOMEN.

#### 1. *Blood.*

Wounds of the spleen, and of such veins and arteries, as are above a certain size, almost always prove fatal from internal hemorrhage. The blood generally makes its way downwards, and accumulates at the inferior part of the abdomen, unless the existence of adhesions happen to oppose the descent of the fluid to the most depending situation. The belly swells, and the fluctuation of a fluid is perceptible through the anterior part of the abdominal parietes. The patient grows pale, loses his strength, is affected with syncope, and his pulse becomes weaker and weaker. In short, the symptoms, usually attendant on hemorrhage, are observable. The viscera and vessels in the abdomen being continually compressed on all sides, by the surrounding parts, the blood cannot be effused, without overcoming a certain degree of resistance; and unless a vessel of the first magnitude, like the aorta, the vena cava, or one of their principal branches, has been wounded, the blood escapes from the vessel slowly, and several days elapse, before any considerable quantity has accumulated in the lesser cavity of the pelvis.

In these cases of extravasated blood, the symptoms which, perhaps, had disappeared, under the employment of bleeding and anodyne medicines, now come on again. A soft, fluctuating tumour may be felt at the lower part of the abdomen; sometimes on the right side; sometimes on the left; occasionally, on both sides. The pressure, made by the effused blood on the urinary bladder, excites distressing inclinations to make water; while the pressure, which the sigmoid flexure of the colon suffers, is the cause of obstinate constipation. In the mean time, the quantity of extravasated blood increasing, irritation and inflammation of the peritoneum are induced. The pulse grows weaker; debility ensues; the countenance is moistened with cold perspirations; and, unless instigated by all the antecedent circumstances, the surgeon practises an incision for the discharge of the fluid, the patient falls a victim to the accident.

In the year 1733, Vacher, principal surgeon of the military hospital at Besancon, successfully adopted this mode of treatment, as I have more particularly noticed in the article *Extravasation.* Petit (the son) afterwards tried the same plan, though it did not answer, (as is alleged) in consequence of the inflammation having advanced too far, before the operation was performed. Long before the time of Vacher and Petit, a successful instance of similar practice had been recorded by Cabrole, in a work, which this author published, under the title of *Αλφαβῆτον ανάτομικον*, id est, Anatomes elenchus accuratissimus, omnes humani corporis partes eâ quâ solent secari methodo, delineans. Accessere osteologia, observationesque Medicis ac Chirurgis perutiles. Genevæ 1604. Hence, as Sabatier has remarked, the method pursued by Vacher was not so new as Petit imagined. (*Médecine Opératoire, Tom.* 1, *p.* 32.)

Indeed, when the symptoms leave no doubt of there being a large quantity of blood extravasated in the abdomen; when the patient's complaints are of a very serious nature, and are evidently owing to the irritation and pressure of the blood on the surrounding viscera; and when a local swelling denotes the seat of the extravasation, there cannot be two opinions about the propriety of making an incision for its evacuation.

Surgeons, however, should recollect, that a small extravasation of blood may exist, without producing any considerable irritation, provided no opening be made into the cyst, with which it becomes surrounded. On the contrary, when such cyst is opened, the air then having free access to the blood contained there, that part of the fluid, which cannot be discharged, is apt to putrify, and become so irritating, as to excite inflammation of the surrounding parts. —Even though there may be an evident extravasation of blood, the bad symptoms are also sometimes entirely owing to the injury done to the parts within the abdomen, and neither to the pressure, nor the irritation of the effused blood.

But, sometimes, as we have already noticed, the accumulated blood at first, neither irritates the adjacent parts by its quantity nor quality. An inflammation, however, of the parts surrounding the extravasation, at length takes place. The tension, irritation, and pain, which, in the first instance, arose from the wound itself, and subsided, seem now to be renewed. When the extravasation is at the lower and anterior part of the abdomen, the patient experiences pain about the hypogastric region. He is also constipated, and, as he suffers great irritation of the bladder, he feels frequent propensities to make water, but cannot relieve himself. At last, a tumour makes its appearance, attended with a fluctuation more or less distinct.

In this instance, it seems proper to give vent to the accumulated blood. If this fluid should be found coagulated, injections of warm water would facilitate its discharge. (*Sabatier Médecine Opératoire, Tom.* 1.)

### 2. *Chyle and Feces.*

These are not so easily extravasated in the abdomen as blood, because they do not require so much resistance, on the outside of the stomach and intestines, to make them continue their natural route through the alimentary canal, as blood requires to keep it in the vessels. Extravasations of this kind, however, sometimes happen, when the wound is large and the bowel distended at the moment of the injury, or when, as Mr. Travers has likewise explained, air is extravasated, or blood effused in the abdomen; these fluids being incapable of making effectual resistance to the escape of the intestinal matter. (See *an Enquiry into the Process of Nature in repairing Injuries of the Intestines, &c. p.* 26.) Nothing is a better proof of the difficulty with which chyle and feces are extravasated, than the operation of an emetic, when the stomach is wounded and full of aliment. In this instance, if the resistance to the extravasation of the contents of the stomach were not considerable, they would be effused in the abdomen, instead of being vomited up. A peculiarity in wounds of the stomach and intestines is, that the opening, which allows their contents to escape, may also allow them to return into the wounded viscus.

Extravasation of intestinal matter in the abdomen is attended with a severe train of febrile symptoms; dryness of the mouth, tongue, and fauces; considerable pain and swelling of the belly; convulsive startings; and hiccough and vomiting, with which the patients are generally attacked the day after the receipt of the wound. (*Sabatier de la Médecine Operatoire, Tom. 1, p.* 34.)

In these cases, general means are the only ones, which can be employed; venesection, fomentations, low diet, perfect rest, anodynes, &c. All solid food must be most strictly prohibited. The close state of the viscera may also be increased by applying a bandage round the body.

If the symptoms are not speedily assuaged, the abdominal viscera become affected with general inflammation, and gangrene, and the patients die in the course of a few days.

### 3. *Bile.*

Bile, on account of its great fluidity, is more easily extravasated extensively in the abdomen, than either blood, or the contents of the stomach and intestines. Besides, the gall bladder has the power of contracting itself so completely, as to expel the whole of its contents. Notwithstanding these circumstances, however, extravasations of this kind are exceedingly uncommon, doubtless, on account of the small size of the gall bladder, and its deep guarded situation, between the concave surface of the liver, and upper part of the transverse arch of the colon.

Sabatier informs us, that he has only been able to find one example on record. This case, after having been communicated to the Royal Society of London, by Dr. Steward (No. 414, pag. 341. Abridgm. Vol. 7, pag. 571—572), was inserted, as an extract, in the third volume of the Edinburgh Essays, and also in the third volume of Van Swieten's Commentaries on the Aphorisms of Boerhaave, (transl. p. 65, edit. 1754). An officer received a wound, penetrating the cavity of the abdomen, and entering the fundus of the gall bladder, without doing any material injury to the adjacent parts. The abdomen was immediately distended, as if the patient had been afflicted with an ascites, or tympanitis; nor did the swelling either increase, or diminish, till the patient's death, which happened a week after the infliction of the wound. There was no rumbling noise in the abdomen, though it was exceedingly tense. There were no stools, and very little urine was discharged, notwithstanding purgatives, and glysters, and a good deal of liquid nourishment, were given. The patient never had one instant of sound sleep, but was always restless, though anodynes were exhibited. There was no appearance of fever, and the pulse was always natural till the last day of the patient's life, when it became intermittent. The intestines were found, after death, very much distended, the gall bladder quite empty, and a large quantity of bile extravasated in the abdomen.

Sabatier met with an opportunity of observing the symptoms of an extravasation of bile, in consequence of a wound of the gall bladder. The patient's abdomen swelled very quickly; his respiration became difficult, and he soon afterwards complained of tension, and pain in the right hypochondrium. His pulse was small, frequent, and contracted; his extremities were cold, and his countenance very pale. The bleedings, which were practised the first day, gave him a little relief; but the tension of the abdomen, and the difficulty of breathing, still continued. A third bleeding threw the patient into the lowest state of weakness, and he vomited up a greenish matter. On the third day, the lower part of the belly was observed to be more prominent, and there was no doubt of an extravasation. M. Sabatier introduced a trocar, and gave vent to a green blackish fluid, which had no smell, and was pure bile, that had escaped from the wound of the gall bladder. After the operation, the patient grew weaker and weaker, and died in a few hours. On opening the body, a large quantity of yellow bile was found between the peritoneum and intestines; but, it had not insinuated itself among the convolutions of the viscera. A thick gluten connected the bowels together, and they were prodigiously distended. The gall bladder was shrivelled, and almost empty. Towards its fundus, there was a wound, about a line and a half long, corresponding to a similar wound in the peritoneum. The wound, which had occurred at the middle and lower part of the right hypochondrium, between the third and fourth false ribs, had glided from behind forward, and from above downward, between the cartilages of the ribs, until it reached the fundus of the gall bladder.

Sabatier takes notice, that the symptoms of the two cases, which have just now been related, were very similar. Both the patients were affected with an exceedingly tense swelling of the belly unattended with pain, or borborygmus, and they were both obstinately constipated. Their pulse was extremely weak the latter days of their indisposition, and they were afflicted with hiccough, nausea, and vomiting.

M. Sabatier seems to think one thing certain, viz. that wounds of the gall bladder attended with effusion of bile, are absolutely mortal, and that no operation can be of any avail. (*Médecine Opératoire, Tom.* 1, *p.* 34—37.)

We are however to infer the contrary from the extraordinary case lately published by Mr. Fryer, of Stamford. A boy, about thirteen years old, received a violent blow from one of the shafts of a cart, on the region of the liver. The injury was succeeded by pain, frequent vomiting of bilious matter, great sinking, coldness of the extremities, and a weak, small, fluttering pulse. The belly was fomented, and purging clysters thrown up. On the third day, symptoms of inflammation began, attended with considerable pain about the liver, great tension and soreness of the abdomen, and frequent vomiting. The pulse was quick, small, and weak; the skin hot and dry; the tongue much furred; the urine high-coloured; and there was some difficulty of breathing; and great thirst. Eight ounces of blood were taken away, the fomentations continued, and a few grains of calomel were directed to be given every four hours until the bowels were properly opened. Afterwards the effervescing mixture, with ten drops of laudanum, was exhibited every four hours.

On the following day, the patient had had some motions, and was much better; but, as his sickness continued, he was ordered a grain of opium every four hours. About a week afterwards, he complained of a great increase of pain, which was somewhat relieved by a blister. He was now completely jaundiced, and his stools were white, but the tension, pain, and sickness were abated.

Two days afterwards, a fluctuation was perceived in the abdomen, which in another week became considerably distended with fluid. The patient now did not complain of much pain; but appeared to be sinking fast: A puncture was made in the swelling, and thirteen pints of what appeared to be pure bile were evacuated. The bowels then soon became regular, and the appetite good. In twelve days, the operation was repeated, and fifteen pints of the same bilious fluid were drawn off. Nine days afterwards, another puncture was made, and thirteen pints more let out; and six were discharged in another fortnight. From this period the boy went on well, and perfectly recovered under the use of light tonic medicines. (See *Medico-Chirurgical Transactions, Vol.* 4, *p.* 330.)

A previous accidental adhesion of the gall bladder to the peritoneum might also certainly prevent the extravasation of bile, and its dangerous effects. (*Callisen, Syst. Chir. Hodiernæ, T.* 1, *p.* 718.)

### 4. *Urine.*

Urine being of a very fluid nature may, like the bile, be easily extravasated in the abdomen, when the bladder is wounded at any part, which is connected with the peritoneum. If the urine, in this kind of case, be not drawn off with a catheter, so as to prevent it from issuing by the wound of the bladder, the patient soon perishes. There are many instances recorded of the bladder being injured even by gun-shot wounds, which were not mortal. Such wounds, however, might only have injured the sides, or lower part of the bladder. But, in operating for the stone, above the pubes, the bladder has undoubtedly been occasionally cut at the part of the fundus, which is covered with the peritoneum. However, as the accident was known in the first instance, the right treatment was adopted, and such patients have recovered. (*Sabatier, Médecine Opératoire, Tom.* 1, *p.* 37.)

Wounds of the bladder are particularly characterized by a discharge of bloody urine and difficulty of making water. They must always be regarded as dangerous cases, both on account of the risk of the effusion of so irritating a fluid in the abdomen, and of the chance of extravasation in the cellular membrane. Under proper treatment, however, they often admit of cure. (See *Gun-shot Wounds.*) The effused fluid should, if possible, be discharged by a depending posture, or suitable punctures, or incisions, and its recurrence prevented by the introduction of a catheter, which is to be left in the urethra. The patient must also be allowed little drink. As for the tension and pain of the belly, the common attendants of a wounded bladder, they may be greatly relieved by the use of the warm bath. (*Callisen, T.* 1, *p.* 719.) Bleeding and other antiphlogistic means are not to be omitted.

## WOUNDS OF THE INTESTINES.

The vomiting of blood, or discharge of it by stool, the escape of fetid air, or of intestinal matter, from the mouth of the wound; an empty collapsed state of a portion of bowel, protruded at the opening in the skin, are the common symptoms attending a wound of this kind. When the wound is situated in the protruded portion, it is obvious to the surgeon's eye; but when it affects a part of the intestinal canal within the abdomen, the nature of the case can only be known by a consideration of other symptoms. In addition to such as I have already described, there are some others, which ordinarily accompany wounds of the bowels; as, for instance, oppression about the præcordia, acute or griping pain in the belly, cold sweats, syncope, &c. But unless the wounded intestine be protruded, there is no practical good in knowing whether the bowel is injured or not, since, if it be in the abdomen, the treatment ought not to be materially different from that of a simple penetrating wound of the belly, unattended with a wound of any of the viscera. Large wounds of the small intestines, particularly, of the duodenum and jejunum, are attended with acute fever, anxiety, paleness of the countenance, syncope, cold perspirations, a small, intermitting, tremulous pulse, and they frequently prove fatal. Injuries of the small intestines are also more often, than those of the large ones, followed by extravasation. A total division of the upper part of the intestinal canal, towards the pylorus, will deprive the body of the nourishment requisite for its support. If the chyle escape from the wound, the patient will die of a slow marasmus; and if it become extravasated, it will be likely to excite such irritation as will prove fatal. The escape of excrement, or of fetid air from the wound, indicates an injury of one of the large intestines. In these cases, the symptoms are generally milder, and the passage of the intestinal contents outward through the wound more easy, on account of the bowel being less moveable. For the same reason, the wounded intestine more readily contracts an adhesion to the adjacent parts. (*Callisen, Syst. Chirurgiæ Hodiernæ, T.* 1, *p.* 717.)

A wounded intestine is said to present some particular appearances, to which the generality of writers have paid no attention: "If a gut be punctured, the elasticity of the peritoneum, and the contraction of the muscular fibres, open the wound, and the villous, or mucous coat, forms a sort of hernial protrusion, and obliterates the aperture. If an incised wound be made, the edges are drawn asunder and reverted, so that the mucous coat is elevated in the form of a fleshy lip. If the section be transverse, the lip is broad and bulbous, and acquires tumefaction and redness from the contraction of the circular fibres behind it, which produces, relatively to the everted portion, the appearance of a cervix. If the incision is according to the length of the cylinder, the lip is narrow, and the contraction of the adjacent longitudinal, resisting that of the circular fibres, gives the orifice an oval form. This eversion and contraction are produced by that series of motions, which constitutes the peristaltic action of the intestines." (*Travers on Injuries of the Intestines, p.* 85.)

According to this gentleman, some of these appearances were described by Haller, in *Element. Physiol. lib.* 24, *sect.* 2. *and Opera Minora, tom.* 1, *sect.* 15.

Having witnessed the facility, with which considerable injuries of the intestinal tube were repaired, Mr. Travers was desirous of ascertaining more fully the powers of nature in the process of spontaneous reparation, and of determining, under how great a degree of injury, it would commence, as well as the mode of its accomplishment. For these purposes, he divided the small intestine of several dogs as far as the mesentery. All these animals died, in consequence of the intestinal matter being extravasated, if they had been lately fed, or if they had been fasting in consequence of inflammation, attended with a separation of the ends of the divided bowel, eversion of the mucous coat, and obliteration of the cavity, partly, by this eversion, and partly by a plug of coagulated chyle.

In one particular instance in which Mr. Travers made a division of the bowel, half through its diameter, a sort of pouch was formed round the injured intestine. "A pouch, resembling somewhat the diverticulum in these animals, was formed opposite to the external wound, on the side of the parietes, by the lining peritoneum, on the other side, by the mesentery of the injured intestine, that intestine itself, and an adjacent fold, which had contracted with it a close adhesion. The pouch, thus formed and insulated, included the opposed sections of the gut, and had received its contents, &c. The tube, at the orifices, was narrowed by the half eversion, but offered no impediment to the passage of fluids." (*P.* 96.) Whether, under these circumstances, the functions of the alimentary canal could have been continued, Mr. Travers professes himself incapable of deciding. Among the inferences, which this gentleman has drawn from the experiments, detailed in his publication, the tendency of the two portions of a divided bowel to recede from each other, instead of coalescing to repair the injury, merits notice, in as much as it tends to shew, that the only means of spontaneous reparation consist in the formation of an adventitious canal, by the encircling bowels and their appendages. The everted mucous coat, which is the part opposed to the surrounding peritoneum, is also indisposed to the adhesive inflammation.

When, however, the wound of the intestine is smaller, the obstacles to reparation are not absolutely insurmountable. Here, retraction is prevented, and the processes of eversion and contraction modified by the limited extent of the injury. If, therefore, the adhesive inflammation unite the contiguous surfaces, effusion will be prevented, and the animal escape immediate destruction. But, union can only take place through the medium of the surrounding parts.

According to Mr. Travers, it is the retraction immediately following the wound, that is a chief obstacle to the reparation of the injury; for, if the division be performed in such a way, as to prevent retraction, the canal will be restored in so short a time, as but slightly to interrupt the digestive function. In confirmation of this state, a ligature was tightly applied round the duodenum of a dog, which became ill, but entirely recovered, and was killed. "A ligature, fastened around the intestine, divides the interior coats of the gut, in this effect resembling the operation of a ligature upon an artery. The peritoneal tunic alone maintains its integrity. The inflammation, which the ligature induces on either side of it, is terminated by the deposition of a coat of lymph, which is exterior to the ligature, and quickly becomes organized. When the ligature, thus enclosed, is liberated by the ulcerative process, it falls of necessity into the canal, and passes off with its contents." (*P.*103—104.)

It appears also from Mr. Travers's experiments and observations, that longitudinal wounds of the bowels are more easily repaired than such as are transverse. In a dog, a longitudinal wound, of the extent of an inch and a half, was repaired by the adhesive inflammation. Here the process of eversion is very limited; the aperture bears a smaller proportion to the cylinder of the bowel; and the entire longitudinal fibres resist the action of the circular, which are divided, and can now only slightly lessen the area of the canal. (*P.* 108).

We come now to the consideration of the treatment, which may be proper in cases of wounds of the intestines; a subject in which much difference of opinion has prevailed; principally, however, concerning the circumstances, in which sutures are necessary, and the most advantageous way of applying them.

When the wounded bowel lies within the cavity of the abdomen, no surgeon of the present day would have the rashness to think of attempting to expose the injured intestine, for the purpose of sewing up the breach of continuity in it. In fact, the surgeon seldom knows at first what has happened; and when the nature of the case is afterwards manifested, by the discharge of blood per anum, an extravasation of intestinal matter, &c. it would be impossible to get at the injured part of the bowel, not only because its exact situation is unknown, but, more particularly, on account of the adhesions, which are always formed with surprising rapidity. But, even if the surgeon knew, to a certainty, in the first instance, that one of the bowels was wounded, and the precise situation of the injury, no suture could be applied, without considerably enlarging the external wound, drawing the wounded intestine out of the cavity of the abdomen, and handling and disturbing all the adjacent viscera. Nothing would be more likely, than such proceedings, to render the accident, which may originally be curable, unavoidably fatal. I entirely agree upon this point with Mr. John Bell, who says, "When there is a wounded intestine, which we are warned of only by the passing out of the feces, we must not pretend to search for it, nor put in our finger, nor expect to sew it to the wound; but we may trust, that the universal pressure, which prevents great effusion of blood, and collects the blood into one place, that very pressure, which always causes the wounded bowel and no other to protrude, will make the two wounds, the outward wound and the inward wound of the intestine, oppose each other, point to point; and, if all be kept there quiet, though but for one day, so lively is the tendency to inflame, that the adhesion will be begun, which is to save the patient's life." (*Discourses on Wounds, p.* 361, *edit.* 3.)

When the extravasation, and other symptoms, a few days after the accident, shew the nature of the case, a suture can be of no use whatever, as the adhesive inflammation has already fixed the part in its situation, and the space, in which the extravasation lies, is completely separated from the general cavity of the abdomen, by the surrounding adhesions.

When the bowel is not protruded, and the opening in it is situated closely behind the wound in the peritoneum, a suture is not requisite, for the contents of the gut not passing onward, will be discharged from the outer wound, and not be diffused among the viscera, if care be taken to keep the external wound open. There is no danger of the wounded bowel changing its situation, and becoming distant from the wound in the peritoneum, for the situation which it now occupies is its natural one. Nothing, but violent motion, or exertions, could cause so unfavourable an occurrence, and these should always be avoided. The adhesions which take place in the course of a day or two, at length render it impossible for the bowel to shift its situation.

Things, however, are far different when the wounded part of the bowel happens to be protruded. Here we have the authority of all writers, in sanction of the employment of a suture. No enlargement of the outer wound is requisite to enable the practitioner to adopt such practice; there is no disturbance of the adjacent parts; there is no doubt concerning the actual existence of the injury, no difficulty in immediately finding out its situation.

But, though authors are so generally agreed about the propriety of using a suture, in the case of a wounded and protruded bowel, they differ exceedingly, both as to the right object of the method, and the most advantageous mode of sewing the injured part of the intestine. Some have little apprehension of extravasation, advise only one stitch to be made, and use the ligature chiefly with a view of confining the injured bowel near the external wound, so that, in the event of an extravasation, the effused matter may find its way outward. Other writers wish to remove the possibility of extravasation, by applying numerous stitches, and attach little importance to the plan of using the ligature principally for the purpose of keeping the intestine near the superficial wound.

When the wound of a bowel is so small, that it is closed by the protrusion of the villous coat, the application of a suture must evidently be altogether needless; and since the ligature would not fail to cause irritation, as an extraneous substance, the employment of it ought unquestionably to be dispensed with.

Supposing, however, the breach in the intestine to be small, but yet sufficient to let the feces escape, what method ought to be adopted? The following practice seems rational. As Mr. Astley Cooper was performing the operation for a strangulated hernia, at Guy's hospital, an aperture, giving issue to the intestinal contents, was discovered in a portion of the sound bowel, just when the part was about to be reduced. The operator, including the aperture in his forceps, caused a fine silk ligature to be carried beneath the point of the instrument, firmly tied upon the gut, and the ends cut off close to the intestine. The part was then replaced, and the patient did well. Mr. Travers, who has related this fact, approves of the plan of cutting away the extremities of the ligature, instead of leaving them hanging out of the external wound. It appears, that, when the first practice is followed, the remnant always makes its way into the intestine, and is discharged with the stools, without any inconvenience. But, when the long ends are drawn through the outer wound, and left in it, they materially retard the process of healing. (See *Travers on Injuries of the Intestines, &c. p.* 112, 113.)

Let us now enquire into what ought to be the conduct of a surgeon, should he be called to a patient, whose bowel is divided through its whole cylinder, and protruded out of the external wound.

Various have been the schemes and proposals, for the treatment of this sort of accident; and since experience has furnished few practitioners with an opportunity of seeing such a case in the human subject, a variety of experiments have been made on animals, in order to determine what treatment would be the most successful. Ramdohr, indeed, is stated by Moebius to have had occasion to try on the human subject, a plan, of which a vast deal has been said and written. He cut off a large part of a mortified intestine, and joined the two sound ends together, by inserting the upper within the lower one, and fixing them in this position with a suture, the ligature being also employed to keep them at the same time near the external wound. The patient recovered, and the feces continued to pass entirely by the rectum in the natural way. (See *Halleri Disput. Anat. Vol. 6. Obs. Med. Miscellan.* 18.)

About a year after the operation, the patient died, when the anatomical preparation of the parts was sent by Ramdohr to Heister. They were preserved in spirits of wine, and exhibited, according to the latter author, an union of the two ends of the bowel together, and *their consolidation with a part of the abdomen.* Now it has been questioned by a late writer, whether the union here spoken of ever really happened. When the upper end of the bowel is introduced into the lower, the external surface of the former is put in contact with the inner one of the latter; a serous membrane is placed in opposition with a mucous one. These heterogeneous structures, he alleges, are not disposed to unite. The mucous membrane, when inflamed, more readily secretes a kind of mucus, which would be an invincible obstacle to adhesion. He thinks it therefore more than probable, that, in the case related by Heister, the invagination was maintained by the union of the intestine with the corresponding part of the abdominal parietes. Several experiments on living animals have convinced him, that this happens, and that the mucous membrane will not unite with the external peritoneal coat. This impossibility of producing an immediate union between the mucous and serous membranes may of course be urged as an objection to Ramdohr's practice. (*Richerand, Nosographie Chirurgicale, T.* 3, *p.* 344—345, *Edit.* 4.) Another equally strong objection is, that the upper end of the bowel cannot be put into the lower one, unless it be separated from a part of the mesentery. Here the division of the mesenteric arteries may cause a dangerous bleeding. In vain did Boyer tie seven, or eight of these vessels: his patient died with an extravasation in the abdomen. (*Richerand, T.* 3, *p.* 343, *Edit.* 4.)

Moebius attempted to repeat Ramdohr's operation upon a dog; but, he could not succeed in insinuating the upper part of the divided bowel into the lower one, on account of the contraction of the two ends of the intestinal tube, and the smallness of the canal. Moebius, therefore, was obliged to be content with merely bringing the ends of the bowel together with a suture: the animal died, however, of an extravasation of the feces.

Dr. Smith, of the Philadelphia Medical Society, also tried to repeat Ramdohr's method, but could not succeed. He divided the intestine of a dog transversely, and having inserted a piece of candle into that portion of the bowel, which was supposed to be uppermost, he endeavoured to introduce the superior within the inferior; but, the ends became so inverted, that it was found utterly impossible to succeed. The scheme was therefore given up, and only one stitch made, the ligature being then attached to the external wound, in the manner advised by Mr. John Bell. The dog died, and, on examination, there was found a considerable quantity of feces and water in the abdominal cavity.

Two more trials were made of Mr. John Bell's plan by Dr. Smith, on the intestines of dogs: in both instances the animals died, the intestines being much inflamed, and feces effused in the abdomen. (See *Dr. Smith's Thesis.*)

Mr. Travers likewise tried the same experiment. "I divided the small intestine of a dog, which had been for some hours fasting, and carried a fine stitch through the everted edges, at the point opposite to their connexion with the mesentery. The gut was then allowed to slip back, and the wound was closed. The animal survived only a few hours. *Examination.* The peritoneum appeared highly inflamed. Adhesions were formed among the neighbouring folds, and lymph was deposited in masses upon the sides of the wounded gut. This presented two large circular orifices. Among the viscera were found a quantity of bilious fluid, and some extraneous substances, and a worm was depending from one of the apertures. By the artificial connexion of the edges in a single point of their circumference, and their natural connexion at the mesentery, they could recede only in the intervals, and here they had receded to the utmost." In another experiment, Mr. Travers increased the number of points of contact, by placing three single stitches upon a divided intestine, cutting away the threads, and returning the gut. The animal died on the second day. *Examination.* Similar marks of inflammation presented themselves. The omentum was partially wrapped about the wound; but, one of the spaces, between the sutures, was uncovered, and from this the intestinal fluids had escaped. On cautiously raising the adhering omentum, the remaining stitches came into view. Here again the retraction was considerable, and the intervening elliptical aperture proportionally large. On the side, next to the peritoneum, however, the edges were in contact and adhered, so as to unite the sections at an angle.

From such experiments, the conclusion, drawn by Mr. Travers, is, that apposition, at a point, or points, is, as respects effusion, more disadvantageous, than no apposition at all; for, it admits of retraction, and prevents contraction, so that each stitch becomes the extremity of an aperture, the area of which is determined by the distance of the stitches. (*P.* 116, 119.) This gentleman, therefore, maintains, *that the absolute contact of the everted surfaces of a divided intestine, in their entire circumference, is requisite to secure the animal from the danger of abdominal effusion.* (*P.* 121.) The species of suture employed (says Mr. Travers) is of secondary importance, if it secures this contact. (*P.* 134.) And among other observations, I find "wounds amounting to a *direct* division of the canal are irreparable, and therefore invariably fatal." (*P.* 133.)

Without entertaining the least desire to give offence, I confess, I do not know what could induce Mr. Travers to be so positive in these inferences. We are told, that apposition at a point, or points, is, as respects effusion, more disadvantageous than no apposition at all, and that the absolute contact of the divided surfaces, in their entire circumference, is requisite to secure the animal from the danger of abdominal effusion. The foundation of these unqualified conclusions is five experiments, made on dogs, in four of which experiments, the divided bowel was brought together with one stitch, on Mr. John Bell's plan, while, in another, three stitches were made; and, yet, in all these instances, the animals died with the contents of the bowels effused. So far the inferences seem established. Unfortunately, for their stability, however, Mr. Travers immediately afterwards proceeds to relate other experiments, instituted by Mr. Astley Cooper, Dr. Thomson, and Dr. Smith, which, though Mr. Travers seems unaware of the fact, tend most completely to overturn the conclusions which he had been previously making.

"Mr. Cooper repeated the experiments of Duverger, who had succeeded, in uniting by suture, the divided intestine of a dog, including in it a portion of the trachea of a calf. In place of the uninterrupted suture, three distinct stitches were inserted. On the sixteenth day, the animal was killed, and the union was complete." (*P.* 123.)

Here we have two facts, proving that a wounded intestine may be united, though the suture was not such, as to maintain the divided surfaces in contact, in the whole of their circumference.

Mr. Astley Cooper then made the experiment, without including the foreign substance. The animal recovered, being a third fact, tending to shew, that the absolute contact of every point of the ends of the divided bowel is not essential to the cure. (See *A. Cooper on Inguinal and Congenital Hernia. Chap. II.*)

After dividing the small intestine of a dog, Dr. Thomson, Regius professor of Military surgery at Edinburgh, applied five interrupted stitches, at equal intervals, the ends of the ligatures were cut off, and the external wound was closed with a suture. This animal did not die of the operation, and, when he was afterwards killed, it appeared, that the threads had made their way into the interior of the intestinal canal. Dr. Thomson repeated this experiment, and did not kill the animal till six weeks afterwards, when the same tendency of ligatures to pass into the bowels, and be thus discharged, was exemplified.

These two last cases make five, in proof that the absolute contact of every part of the ends of a divided bowel is not essential to prevent effusion, or the consequences of the wound from proving fatal; and several other experiments were made by Dr. Smith, of Philadelphia, who employed four stitches, with similar success.

As far then as the majority of such facts ought to have weight, we are bound to receive the conclusions of Mr. Travers as incorrect, and unestablished. I am only surprised, that Mr. Travers himself, who has cited the particulars of all these last experiments, did not perceive, that they struck directly at his own inferences. They are not only irresistible arguments against Mr. Travers's conclusion, that the union of a divided bowel requires the contact of the cut extremities in their entire circumference; but, they are a plain denial of another position, advanced by this author, viz. that wounds, amounting to a direct division of the canal, are irreparable, and, therefore, invariably fatal.

With respect to the species of suture being of secondary importance, provided it secure the complete contact of every part of the everted ends of the divided bowel, I regret, that Mr. Travers has omitted to institute experiments, in order to show, that any such suture can be practised, and, if he has the ingenuity to apply it, whether the result would be for, or against, the conclusions, which he has formed. The fact of the sutures always making their way into the cavity of the bowel, and being thus got rid of, appears to me highly interesting, since it shews the safety of cutting away the ends, instead of leaving them hanging out of the external wound, so as to create the usual irritation and inconveniences of extraneous substances. It seems, that Mr. Benjamin Bell first recommended cutting the ends of the ligatures away, and reducing the bowel in this state into the abdomen, as he says, a considerable part of the remainder of the ligature will fall into the cavity of the gut. (*System of Surgery, Vol. II. p. 128, Edit. 7.*) We have seen, that the experiments of Dr. Thomson confirm the observation, and those, instituted by Mr. Travers, tend to the same conclusion.

According to the latter writer, the following is the process by which a divided intestine is healed, when sutures are employed. "It commences with the agglutination of the contiguous mucous surfaces, probably, by the exudation of a fluid, similar to that, which glues together the sides of a recent flesh wound, when supported in contact. The adhesive inflammation supervenes, and binds down the everted edges of the peritoneal coat, from the whole circumference of which a layer of coagulable lymph is effused, so as to envelope the wounded bowel. The action of the longitudinal fibres, being opposed to the artificial connexion, the sections mutually recede, as the sutures loosen by the process of ulcerative absorption. During this time, the lymph deposited becomes organized, by which further retraction is prevented, and the original cylinder, with the threads attached to it, is encompassed by the new tunic.

"The gut ulcerates at the points of the ligatures, and these fall into its canal. The fissures, left by the ligatures, are gradually healed up; but, the opposed villous surfaces, so far as my observation goes, neither adhere, nor become consolidated by granulation, so that the interstice, making the division internally, is probably never obliterated." (*Travers on Injuries of the Intestine, &c. p.* 128.)

Notwithstanding I have carefully read all the arguments adduced by Mr. Travers in favour of stitching a divided bowel at as many points as possible, I still remain unconvinced of the advantage of such practice, for reasons already suggested. If a case were to present itself to me, in which a bowel was protruded and partly cut through, I should apply only a single suture, made with a common sewing needle, and a piece of fine silk. If the bowel were completely cut across, I should have no objection to attach its ends together by means of two or three stitches of the same kind. I coincide with Mr. Travers respecting the advantage of cutting off the ends of the ligature, instead of leaving them in the wound, as I believe he is right, in regard to the little chance there is of the injured intestine receding far from the wound, and if the ends of the ligature are then of no use in keeping the bowel in this position, they must be objectionable, as extraneous substances.

Sometimes, only one end of the divided gut protrudes at the wound, and the other lies concealed in the cavity of the abdomen. If the hidden continuation of the intestinal canal cannot be found without enlarging the wound, it may be questioned, whether the urgency of the case does not justify this practice. If the upper end should happen to be the one concealed in the abdomen, almost certain death must result from its continuance there; if it be the lower one, and no attempt be made to find it, the patient can only survive with the loathsome affliction of an artificial anus.

When the protruded intestine is mortified, which must be a very rare occurrence in cases of wounds, the surgeon's conduct should be the same as in a mortified enterocele. (See *Hernia.*)

With regard to the constitutional treatment, in wounds of the intestines, the principal indication is to prevent a dangerous degree of inflammation. Hence bleeding and the antiphlogistic treatment are highly indispensable. Let not the surgeon be deterred from putting such practice in execution by the apparent debility of the patient, his small concentrated pulse, and the coldness of his extremities, symptoms, common in acute inflammation of the bowels, and, in fact, themselves indicating the propriety of repeated venesection. Wounds of the small intestines are attended with more vehement inflammation, than those of the large ones. All flatulent, stimulating, and solid food, is to be prohibited. The bowels are to be daily emptied with glysters, by which means, no matter will be allowed to accumulate in the intestinal canal, so as to create irritation and distention.

When excrementitious matter is discharged from the outer wound, it is highly necessary to clean and dress the part very frequently. Gentle pressure should also be made, with the fingers, at the circumference of the wound, at each time of applying the dressings, for the purpose of promoting the escape of any extravasated matter. For the same reason, the patient should always lie, if convenient, in a posture that will render the external opening a depending one.

After a day or two, the surgeon need not be afraid of letting the outer wound heal up; for the adhesive inflammation, all around the course of the wound, will now prevent any extravasated matter from becoming diffused among the viscera. If the case should end well, the intestine generally undergoes a diminution in its diameter at the place where the wound was situated. When this contraction is considerable, the patient occasionally experiences colic pains at the part, especially after eating such food, as tends to produce flatulence. As these pains usually go entirely off after a certain time, and no inconvenience whatsoever remains, the intestine may possibly regain its wonted capacity again. A more considerable constriction of the above sort has been known to have occasioned a fatal miserere. Even the intestine itself has been known to burst in this situation, after its contents had accumulated behind the contracted part. Patients, who have recovered from wounds of the intestines, should ever afterwards be particularly careful not to swallow any hard substances, or indigestible, flatulent food.

In some instances, intestinal matter continues to be discharged from the outer wound, either in part, or entirely, so that either a fistula, or an artificial anus is the consequence. A fistula is more apt to follow, when an intestine has been injured by a ball, has been quite cut though, or has mortified. But, numerous cases have evinced, that this is not invariably the consequence, and that a perfect cure has frequently followed each of these occurrences.

When an intestine is complelely cut through, and the lower portion of the canal lies inaccessibly concealed in the abdomen, there is a necessity for promoting the formation of an artificial anus. In this particular case, the extremity of the intestine is to be attached, with a fine suture, to the edges of the outer wound. In order to distinguish the upper end of the intestine from the lower one, some recommend giving the patient some milk to drink, and to wait a little, to see whether the fluid issues from the mouth of the gut. In the mean while, they content themselves with applying fomentations. If the upper end of the intestine should be in the abdomen, it certainly seems justifiable, when the accident is quite recent, to dilate the outer wound sufficiently to see, whether the part is near enough to be got at. If the surgeon should succeed in this object, the two ends of the bowel ought to be sewed together, as above directed.

## CONTUSIONS AND OTHER INJURIES OF THE ABDOMEN.

A violent contusion of the abdomen may injure the contained viscera, without the occurrence of any external wound. It was in this way, that the liver, or gall bladder, was ruptured in the boy mentioned by Mr. Fryer, (*Medico-Chir. Trans. Vol.* 4); and that the vena cava was lacerated in the case, which fell under the observation of Richerand, where a cart-wheel passed over a child's belly. (*Nosographie Chir. T.* 3, *p.* 353.) In other instances, the mischief is done to the intestines; and, still more frequently, the viscera, as well as the parietes of the abdomen, have only suffered a more or less forcible contusion. The effects of such violence are inflammation of the injured bowels, and their adhesion to the inside of the peritoneum. Thus, the stomach and intestines, the liver and the gall bladder, when inflamed from a blow upon the front of the belly, contract adhesions to the corresponding portion of the parietes, which has been also bruised and is itself inflamed. When such inflammations suppurate, (and according to Richerand it is their most usual course) on opening the abscess, the pus is found blended with the matter, which the viscera contain, or secrete. Thus, the alimentary matter, and even intestinal worms, have been discharged with the pus on opening certain abscesses, which communicated with the cavity of the stomach, or bowels; and bile has been found blended with the matter of abscesses in the right hypochondrium.

When, in consequence of a blow upon the anterior part of the belly, the patient experiences in the situation of the injury a deeply-seated pain; when a tumour forms, and the symptoms indicate violence done to some of the adjacent viscera; the inflammation is to be opposed by every possible antiphlogistic means. But, when notwithstanding such treatment, the swelling increases and suppurates, the abscess is not to be opened until it is perfectly mature. The inflammatory symptoms, which preceded its formation, indicate that there is an adhesion between the injured organ and the parietes of the abdomen. Without this adhesion, opening the abscess would be attended with more risk, because the pus, or other matter, might become extravasated in the cavity of the peritoneum. For the same reason, in the examples of tumours caused by bile in the gall bladder, J. L. Petit recommends deferring the operation of opening them, until the inflammatory symptoms evince, that an adhesion has taken place between the fundus of the gall bladder, and the corresponding point of the parietes of the abdomen.

An adhesion of the abdominal viscera to the inner surface of the peritoneum may be induced by other causes, besides the action of contusing bodies. A knife, a fork, a shoemaker's awl, a needle, and other extraneous substances, incapable of passing throughout the alimentary canal, have been known to irritate the stomach, or bowel, and to bring on adhesion of them to the parietes of the abdomen, where a tumour has formed, which on being opened has discharged the foreign body. The records of surgery abound in facts of this kind. A fistula succeeds the opening of the abscess; the alimentary matter escapes; and if the aperture admit not of being healed by methodical compression, the intestinal canal between the fistula and the anus contracts; most of the contents of the bowels pass out at the preternatural opening, and the patient falls into a state of marasmus, the more quickly fatal, the nearer the injury of the intestinal canal is to the stomach.

A long continued pressure on the epigastric region may cause an adhesion of the stomach to the peritoneum, and suppuration taking place at the part, a fistula, communicating with the cavity of that organ, may be formed, and allow the victuals to escape externally. (See *Richerand's Physiologie, T. 1. Chymification and Nosographie Chirurg. T. 3, p.* 353—356, *Ed.* 4.)

We shall conclude with repeating, that in the generality of injuries of the abdomen from external violence, whether wounds, or contusions, the principal danger depends upon inflammation of the peritoneum. The main object in the treatment, therefore, is to prevent and oppose this perilous affection. Repeated venesection, the application of leeches, mild aperient medicines and glysters, a low fluid diet, perfect rest, fomentations, and the warm bath, are amongst the most effectual antiphlogistic remedies, which are in such cases entitled to praise and confidence.

For information, relative to wounds of the abdomen, see *Callisen's Systema Chirurgiæ Hodiernæ, T.* 1, *p.* 697, *&c. Edit.* 1798. *Hafniæ. Richerand's Nosographie Chirurgicale, Tom.* 3, *p.* 327, *&c. Edit.* 4. *Medico-Chir. Trans. Vol.* 4, *p.* 330. *J. Crampton's Case of Rupture of the Stomach and escape of its contents, &c. with Obs. by B. Travers, in Med. and Chir. Trans. Vol.* 8, *p.* 228, *&c. Richter's Anfangsgrunde der Wundarzneykunst, Band* 5. *Kap.* 1. *Discourses on the Nature and Cure of Wounds, by John Bell, Edit.* 3. *Encyclopédie Méthodique, Partie Chirurgicale, Art. Abdomen, and Intestins. Dr. Smith's Inaugural Thesis. An Enquiry into the Process of Nature in repairing Injuries of the Intestines, &c. by B. Travers. Hunter on Gunshot Wounds. Mr. A. Cooper's work on Inguinal and Congenital Hernia, Chap. II. Sabatier's Médecine Opératoire, Tom.* 1. *Petit's Essai sur les Epanchemens, & Suite de l'Essai sur les Epanchemens in Mém. de l'Acad. de Chir.*

The best doctrines, relative to wounds in general, are those contained in various parts of *A Treatise on the Blood, Inflammation, &c. by John Hunter. Valuable information may also be collected from John Bell's Principles of Surgery, and his Discourses on Wounds. Larrey's Mémoires de Chirurgie Militaire. The Mémoires et Prix de l'Academie Royale de Chirurgie. Sabatier's Médecine Opératoire. Assalini's Manuale di Chirurgia; Milano,* 1812. *Richerand's Nosographie Chirurgicale. Boyer's Traité des Maladies Chirurgicales, Tom.* 1. *Delpech's Précis des Maladies Reputées Chirurgicales, T.* 1. *Schmucker's Wahrnehmungen und Chirurgische Schriften. Guthrie on Gunshot Wounds. Jones on Hemorrhage. Travers on the Process of Nature in repairing Injuries of the Intestines. Thomson's Lectures on Inflammation, and his Report of Observations made in the Military Hospitals in Belgium; and the various works cited in the course of this article, and at* *the conclusion of that on Gun-shot Wounds.* Some interesting information on poisoned wounds will be found in *Catesby's Hist. of Carolina; Mead on Poisons; Fontana on the Venom of the Viper; Russell on Indian Serpents; Ireland, in Med. Chir. Trans. Vol. 2.*

**WRY-NECK.** (*Torticollis.*) An affection, in which the head becomes inclined to one side. The ancient writers have taken no notice of the disorder. Some of the moderns have termed it *caput obstipum;* a word, indeed, which has been employed by the best Latin authors, to denote the affliction. The wry-neck should be discriminated from the tension and stiffness of the neck, occasioned by a rheumatic affection of this part, and also from the faulty position of the head, arising from deformity in the cervical vertebræ.

Tulpius, who was a learned physician at Amsterdam, about the middle of the seventeenth century, gives an account of the cure of a boy, twelve years old, who, from his earliest infancy, had had his head drawn down towards the left shoulder, by a contraction of the scalenus muscle. Fomentations had been applied in vain, with a view of relaxing the parts, the stiffness and corrugated state of which seemed to produce the disorder. Steel-collars also proved ineffectual in bringing the head into a right posture. Tulpius had a consultation with two other skilful physicians, about the case, and it was decided to put the boy under the care of an eminent surgeon, of the name of Minnius, who had performed several operations with success in similar instances. He first made a large eschar by applying caustic, and then with a knife divided the muscle, which drew the head to one side. Tulpius, who has left only a very confused account of the operation, observes, that it was performed with great slowness and circumspection, for fear of wounding the carotid artery, and jugular vein.

The author expresses his disapprobation of this manner of proceeding, and advises such persons as will run the risk of doing so dangerous an operation not to make any preliminary application of caustic. The latter measure only caused useless pain, and could not possibly be of any service. Tulpius also recommends the operation not to be done by little and little, at repeated times; but, to make a complete division of the muscle at once, with the necessary degree of caution.

Meckren, a surgeon at Amsterdam, who has published a valuable collection of medico-chirurgical cases, also treats of the operation applicable to the wry-neck. He states, that he had seen it performed on a boy, fourteen years old. The tendon of the sterno-cleido-mastoideus muscle was divided with one stroke of a sharp pair of scissars; and in a very skilful manner, by a surgeon named Flurianus, and as soon as the incision was made, the head took its right position. The author has also noticed the remarks made by Tulpius, relative to the plan of operating.

On approaching nearer to modern days, we find, that the celebrated Mr. Samuel Sharp considered the wry-neck as mostly arising from a contraction of the sterno-cleido-mastoideus muscle. He has proposed dividing this muscle, whenever the disorder seems to proceed from the kind of cause, which we have just now mentioned. However, he makes an exception, in regard to those cases, in which the affliction has existed a considerable time, and, particularly, in instances, in which it has prevailed from infancy. He remarks, that it would be impossible to rectify the position of the head, if the cervical vertebræ should have grown in a distorted direction. The following is the operation, which this author recommends to be done in proper cases. After placing the patient on a table, a transverse incision is to be made through the skin and fat, of a size somewhat more extensive, than the breadth of the muscle, and about one-third of its length from the clavicle. A probed-razor is then to be passed underneath the muscle, and to be drawn out, so as to make the requisite division of the part. After the incision was made, Mr. Sharp recommended the wound to be filled with dry lint, and to be always dressed in a way, that would keep the extremities of the muscle from growing together again. For this purpose, he advised the cut ends to be separated from each other as much as possible, by the assistance of a bandage to support the head, during the whole time of the cure, which, he says, will generally be about a month. (See *Treatise on the Operations of Surgery, chap.* 35.)

According to Mr. Sharp's account, the operation above described ought to be a very common one. However, if attention be paid to the nature and causes of the disease, and to the differences, resulting from whether the disorder be recent, or of long standing; constant, or periodical; idiopathic, or sympathetic; dependent on spasm, or merely on paralysis of the antagonist muscles; and, lastly, if it be recollected, that the affection may be produced by other muscles, besides the sterno-cleido-mastoideus; we shall find, that cases, in which the foregoing operation can be judiciously undertaken, are not so very frequent.

With regard to the manner in which Mr. Sharp operated, Mr. B. Bell conceived, that it was attended with hazard of wounding the large blood-vessels. But, though it seems to me better to use a probe-pointed bistoury and a director, than the kind of razor, which Mr. Sharp employed, I do not coincide with Mr. B. Bell in thinking, that the latter surgeon's plan was at all objectionable on the score of danger, in respect to wounding the vessels. Perhaps, some might think Mr. B. Bell's method most likely to injure the large vessels; for, he advises the operator to cut the muscle from without gradually inward, as deeply as seems necessary.

Perhaps, the most prudent method of operating, is to divide the clavicular portion of the contracted muscle, near the clavicle, and even to cut out a sufficient piece, to remove all chance of the two ends uniting again. This step would weaken the muscle considerably, and, perhaps, might answer every purpose. It could easily be accomplished, by means of a director, and curved bistoury, after making the requisite division of the skin with a common scalpel. Were this proceeding only to produce a partial amendment of the wry-neck, the operator might then venture to divide the sternal portion of the muscle. A director should be passed under it, and the division made with a probe-pointed curved knife.

Although the wry-neck may occasionally depend on a contraction of the sterno-cleido-mastoideus muscle, this case is far from being very frequent. The deformity is much oftener owing to some affection of the integuments. M. Louis often divided with success contractions of the skin, which had kept the head drawn to one side for many years, and had been occasioned by burns. He remarks, that he has met with contractions of this kind, which might have been mistaken for a part of the sterno-cleido-mastoideus itself.

Mr. Gooch has related a case of wry-neck, which was caused by a contraction of the platysma myoides muscle. The patient was a young gentleman, fourteen years of age, who appeared to have always enjoyed very good health in every other respect. He had had his head, for several months, strongly drawn to one side by a constant contraction of the platysma myoides muscle, which had become exceedingly rigid, especially just where it is inserted at the basis of the jaw, and it made the skin, from the angle of the os maxillare inferius to the chin, seem like the cicatrix of a burn. The same side of the face, quite from the point of the chin, was much shrunk, and distorted by the contraction of the muscle, and the corner of the mouth, in particular, was so drawn to one side and downward, when the patient turned his head, that a vast deal of deformity was the consequence. From the inferior part of the eye-brow, at the internal angle of the eye, to near the top of the head, there was a kind of furrow upon the skin, about half an inch broad, having a shining, polished appearance, like the cicatrix of a wound, and destitute of hair, which had fallen off. From the corner of the eye downwards, there was the same kind of appearance in a less degree. The patient was subject to repeated attacks of spasms, which began at the insertion of the muscle, and terminated at the eye, attended with a great deal of pain. The ear, and, also, the temporal and frontal muscles, were sometimes affected in a similar manner. The parts, in the course of the insertion of the muscle into the jaw-bone, were considerably thickened, without being in the least inflamed externally, and they were only a little painful, when touched, except they were at the same time stretched. The subjacent muscles did not seem to be at all affected.

It appears from the account, given by Mr. Gooch, that, in the treatment of this affection, every known means had been tried, by the advice of the most eminent practitioners; but, without effect. Mr. Gooch determined to try what benefit would be produced by dividing the muscle in the situation of the disorder. He first divided the integuments a little below the jaw, and thus exposed the whole breadth of the platysma myoides muscle, the fibres of which seemed to be in a state of violent extension, especially, when the patient's head was inclined towards the opposite side. Mr. Gooch then divided the muscle completely across, by a very careful dissection, until he had brought into view the fasciæ of the muscles underneath. The patient was then directed to turn his head towards the opposite side, and Mr. Gooch had the satisfaction of observing, that the patient could perform this motion, without his face, and corner of his mouth being affected, as they had been before. The wound was treated in the ordinary way, and no particular symptoms arose. As soon as the inflammation had subsided, the patient was directed to move his head about very frequently, in order to prevent any kind of stiffness, which might ensue, in consequence of the contraction of the muscular fibres, and inelasticity of the cicatrix.

The patient found himself perfectly relieved by the foregoing operation, and had no return of the painful spasms, to which he had been previously subject. The side of his face, however, never recovered the proper degree of plumpness.—(*Chirurgical Works of B. Gooch, Vol. 2, p.* 81.)

Whenever an attempt has been made to cure a wry-neck, by dividing any of the muscles, or merely the integuments, it becomes necessary to take some measures for keeping the head in a proper position, during the treatment of the wound, lest, in consequence of the head inclining in the direction, in which it was before the operation, the divided parts should immediately grow together again, and bring the patient almost into the same condition, in which he was before anything had been done. With a view of preventing this unpleasant circumstance, Mr. Sharp recommends filling the wound with lint, and making it suppurate. Mr. B. Bell, on the other hand, advises the employment of a proper machine for keeping the head in a due position. Some writers think the use of a bandage quite sufficient for the purpose. Perhaps, as prudent a plan as any, when the sterno-cleido-mastoideus is affected, is to cut out a certain portion of it. See *Sharp's Treatise on the Operations of Surgery, chap.* 35. *Chirurgical Works of B. Gooch, Vol.* 2, *p.* 81. *B. Bell's System of Surgery. Encyclopédie Méthodique, Partie Chirurgicale, Tom.* 2, *Art. Torticollis. Also Dr. Joh. Christ. Gottfr. Jörg, über die Verrkrümmungen der Menschlichen Körpers, und eine rationelle und sichere Heilart Derseldem; Leipzig,* 1810.

THE END.

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